PROCEEDINGS

Fifty-Sixth Annual Convention

OF THE

American Railway Bridge and Building Association

1951

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Proceedings of the

Fifty-Sixth Annual Convention

of the

American Railway Bridge and Building Association

Held at

CHICAGO, ILLINOIS

September 17-19, 1951

Published by the Association
Elise LaChance, Secretary
431 So. Dearborn St., Chicago 5

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OFFICERS FOR 1951

W. A. Huckstep ..... President
Missouri Pacific, St. Louis, Mo.

Guy E. Martin ..... First Vice-President
Illinois Central, Chicago

F. R. Spofford ..... Second Vice-President
Boston & Maine, Dover, N.H.

Lee Mayfield ..... Third Vice-President
Missouri Pacific, Houston, Tex.

H. M. Harlow ..... Fourth Vice-President
Chesapeake & Ohio, Richmond, Va.

Elise LaChance ..... Secretary
431 S. Dearborn Street, Chicago

L. C. Winkelhaus ..... Treasurer
Chicago & North Western, Chicago

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Terms Expire 1951

F. M. Misch, Southern Pacific ..... San Francisco, Cal.

L. R. Morgan, New York Central ..... Detroit, Mich.

J. A. Jorlett, Pennsylvania ..... New York, N.Y.

Terms Expire 1952

M. H. Dick, Railway Engineering & Maintenance ..... Chicago, Ill.

R. R. Gunderson, Southern ..... Washington, D.C.

J. F. Warrenfells, Seaboard Air Line ..... Savannah, Ga.

Past President

W. F. Martens, Atchison, Topeka & Santa Fe ..... San Bernardino, Cal.

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Pennsylvania, New York

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L. R. Morgan, New York Central — Detroit, Mich.

B. M. Stephens, Texas & New Orleans — Houston, Tex.

Past President

W. A. Huckstep, Missouri Pacific — St. Louis, Mo.

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PROCEEDINGS

This section contains a running account of the activities during the three-day annual meeting in 1951; brief abstracts of the addresses read to the joint sessions with the Roadmasters' Association; and all of the B. & B. committee reports, printed in full, with brief abstracts of the discussions that followed their presentation.

Such problems of long standing as the operation and maintenance of heating plants, and the protection of steel bridges against brine drippings—along with problems of more recent origin, such as the effect of the 40-hr. week, and the construction of diesel fueling facilities—were given a thorough airing by the members of the American Railway Bridge & Building Association at its 56th annual meeting held in Chicago at the Stevens Hotel on September 17-19, 1951.

Continuing the practice started in 1946, this meeting was held concurrently, but separately, with the annual convention of the Roadmasters' and Maintenance of Way Association. The two meetings were convened in joint session on Monday morning, September 17 and in another joint session on the afternoon of the following day. The program of the latter session consisted of features of common interest to both groups, including an address by a railroad president, a motion-sound-color picture, and a round-table discussion of the problems of flood rehabilitation encountered during and following the record floods that occurred in the Kansas City area in July. Another feature of the concurrent conventions was the annual banquet which was tendered to the members and families of the two railroad associations by the Track Supply Association and the Bridge and Building Supply Association. In accordance with an agreement of several years' standing, no exhibit of manufacturers' products was sponsored by the two supply associations.

Have Good Attendance

The combined attendance at the two conventions totaled 1,051 railway men and guests. This figure included 681 railway men and 370 supply men (associate members) and guests. In 1950, when an exhibit of manufacturers' products was held simultaneously with the two conventions, a total of 1,159 persons registered at the two conventions.

The separate sessions of the Bridge and Building Association were directed by W. A. Huckstep, general supervisor of buildings, Missouri Pacific, St. Louis, Mo., and president of the association. He was assisted by Guy E. Martin, superintendent water service, Illinois Central, Chicago, and first vice-president of the association.

Preliminary features of the opening session included greetings on behalf of the American Railway Engineering Association by President T. A. Blair (chief engineer system, Atchison, Topeka & Santa Fe, Chicago), on behalf of the Track Supply Association by President R. W. Torbert (Oxweld Railroad Service Company), and on behalf of the Bridge and Building Supply Association by President R. R. Clegg (American Lumber & Treating Co.). Mr. Torbert presented a gavel and badge of office to Mr. Halverson, president of the Roadmasters' and Maintenance of Way Association, and Mr. Clegg presented a gavel and badge of office to Mr. Huckstep. Lewis Thomas (Q and C Co.), secretary of the Track Supply Association, also spoke briefly at the joint opening session, inviting members of the two associations and their families to attend the annual banquet on Tuesday evening.

Mr. Blair, referring to the recent floods that occurred in the Kansas-Missouri area in July, stated that, because of the heavy track construction in vogue today, and the need for providing temporary structures capable of carrying present-day heavy power, the work of reconstruction in such instances is much more difficult than ever before. In spite of these difficulties, he said, the track and bridge officers who supervised the restoration work, organized the efforts of their forces so efficiently and made such effective use of machines, that traffic was restored in less time than would have been required in former years.

The principal address at the joint opening session was made by J. H. Aydelott, vice-president, Operations and Maintenance Department, Association of American Railroads. Immediately after the close of Mr. Aydelott's address, the two associations began their separate sessions.

President Huckstep's Remarks

Addressing the first separate session of the Bridge and Building Association, President Huckstep devoted his remarks primarily to the subject of courtesy, both from the standpoint of its application in creating public good will and its effect in promoting good relations between supervisors and their employees. While much has been heard about this subject, Mr. Huckstep's reasons for discussing it at the conventions was that "any good thing will bear repetition."

"Regardless of any other qualifications he may lack as a salesman," said Mr. Huckstep, "if he is courteous in all of his contacts, an employee can influence business to his railroad and at times may even do so without actually being aware of it." By the same token, "by lack of courtesy, he may possibly sometime bring about the opposite results." Mr. Huckstep then went on to cite two instances in which acts of discourtesy created unfavorable impressions.

"How many of us," inquired Mr. Huckstep, "perhaps irritated for some reason, or possibly a bit too encumbered with work, have answered a telephone, or talked to some person at the end of the line differently than we would have spoken if the person had been sitting across the desk? In the letter we write, do we always express our thoughts in the same words we would if we were carrying on a face-to-face conversation with the person to whom we are writing? Do we instruct people to do something when the same results can be obtained by requesting them to do it?"

Criticize Privately

In the relationship between supervisory officers, foreman and men, Mr. Huckstep described courtesy as being the application of sympathetic understanding. "Courtesy begets respect," he said, "and certainly every supervisory officer should want the respect of the men under his jurisdiction." Noting that all people are not alike, either in appearance, disposition, habits, or other characteristics, Mr. Huckstep explained that "if a supervisor should have men under his jurisdiction from whom satisfactory service or full cooperation is not being secured, he has just as many different problems to solve as he has men with these shortcomings. By employment of tact," he continued, "he can learn just what is necessary to transform such a man into a satisfactory, valuable and satisfied employee. Perhaps a man may be troubled by something that is affecting his work. In such a case, sympathetic understanding and patience on the part of the supervisor, may help to find a solution. Certainly criticism, particularly in the presence of a man's fellow employees, will not do the job and, inwardly at least, he will resent it. If an employee must be criticized or censored, and no doubt there are instances when this becomes necessary, it should be done privately."

Observe 60th Anniversary

A feature of the Bridge and Building sessions was a special program commemorating the association's sixtieth anniversary. On this occasion, nine past presidents of the association were present, including E. H. Barnhart, division engineer, Baltimore & Ohio, who arranged and directed the special program; A. E. Bechtelheimer, engineer of bridges (retired), Chicago & North Western; G. S. Crites, division engineer (retired),Baltimore & Ohio; R. E. Dove, associate editor, Railway Engineering & Maintenance; L. D. Hadwen, engineer masonry construction (retired), Chicago, Milwaukee, St. Paul & Pacific; J. S. Hancock, bridge engineer, Detroit, Toledo & Ironton; N. D. Howard, secretary, American Railway Engineering Association; W. F. Martens, general foreman bridges and buildings, Atchison, Topeka & Santa Fe; and T. H. Strate, division engineer (retired), Chicago, Milwaukee, St. Paul & Pacific. A novel feature of this program was the playing of a wire recording of remarks by the oldest living past-president of the association — J. P. Canty, retired assistant to the engineer maintenance of way of the Boston & Maine. Mr. Canty is 86 years old and served as president of the association in 1908-09.

Among the features of the program commemorating the sixtieth anniversary, was a 20-min. address by Past-President Bechtelheimer, in which he reviewed important events of the association that he had gleaned

from a review of the proceedings of the association from the first to the most recent volume. Dividing his discussion into 10-yr. periods, Mr. Bechtelheimer cited the problems encountered in each, some of which are still present, he said, to plague the b. and b. supervisor of today. He gave due credit to the ability and competence of predecessor members, saying that, in spite of the handicap in not having available many of the machines and powered equipment of today, and even with a lack of knowledge of some materials, such as cement, and their inferior quality as compared with today's products, these men surmounted great difficulties and erected structures that served their purpose well and some are still in service today.

Each of the past-presidents present were invited to speak and most of these remarks concerned interesting events and highlights of the time of his regime. A letter from the oldest past-president of the Bridge & Building Supply Association also was read, and it dealt with the incidence of that association and its close affiliation with and its efforts to have exhibits at each of the annual conventions of the railroad group. The present president, R. R. Clegg, was also asked to address the meeting, but, because of the lack of time to do so, he requested that his remarks be published in the current proceedings, which are as follows:

"We are truly honored and greatly pleased to be invited to take an active part in this celebration of your Sixtieth Anniversary, and it becomes my privilege to congratulate you on behalf of the Bridge and Building Supply Association.

"You know, 60 years is a long time in some ways, but we all know that your Association is really just getting started; you are vigorous, energetic, really full of pep, and ready for whatever comes along.

"You were born in 1891. Well, we—that is the B. & B. Supply Association— started only a few years later, so we can by no means be called a spring chicken. I've been digging into the records, going back year by year, and reading the secretary's minutes and accounts of past treasurers. So far as I can learn, the first time we joined up with you was at your meeting in Denver, Colo., in 1910. There 28 companies got together and exhibited their products. And there our Association was organized with the first set of officers.

"Some of you may remember these men. They were W. H. Lawrence, president; L. E. Wolcott, vice-president; H. Hennig, treasurer; and J. A. Meaden, secretary. Since then we have been together at joint conventions all over the country. Whereever you went, we were right there too. Well, almost—there were some lean years when we had to stay home and look after our pennies. Good old days!

"But we don't want to live in the past, although it holds many pleasant memories. We are living in the present and have an eye out for the future. A future in which we both have a vital interest for the common good of our two associations. Our plans are projected for as far ahead as 1956.

"Your program this year is full of important considerations. But tomorrow evening we can all relax and enjoy a birthday party which has been especially prepared for you by our own B. & B. Supply Association committee. There will be music, singing and dancing, and best of all, good fellowship.

"Again let me say, you are only 60 years young. We have been with you much of that time, and hope to be together—not just a few years more—but forever and a day."

Reports Presented

The separate sessions of the meeting were given over largely to the presentation and consideration of eight technical committee reports on the following subjects: Construction and Maintenance of Diesel Fueling Facilities; Developments in the Use of Laminated Timbers: Economics in Maintenance and Operation of Heating Plants; Fire Protection of Bridges, Trestles and Culverts; Accident Prevention in Maintenance and Use of Work Equipment; Protection of Steel Bridges Against Brine Drippings; Comparative Economies of Material for Building Exteriors; and Effects of the 40-Hr. Week on Bridge and Building Maintenance.

After the close of the business session on Wednesday noon, September 19, about 55 of those present, including a number of wives of members, participated in a bus trip to inspect the testing facilities at Chicago of the Underwriters' Laboratories, Inc.

In the election of officers, Mr. Martin was advanced to president; F. R. Spofford, assistant division engineer, Boston & Maine, Dover, N.H., was advanced from second vice-president to first vice-president; Lee

Mayfield, resident engineer, Missouri Pacific Lines, Houston, Tex., was moved up from third vice-president to second vice-president; H. M. Harlow, assistant general supervisor bridges and buildings, Chesapeake & Ohio, Richmond, Va., was promoted from fourth vice-president to third vice-president; J. A. Jorlett, assistant engineer, Pennsylvania, New York, was advanced from director to fourth vice-president; and L. C. Winkelhaus, architectural engineer, Chicago & North Western, was elected treasurer. Directors elected were L. R. Morgan, fire prevention engineer, New York Central, Detroit, Mich. (re-elected); B. M. Stephens, assistant chief engineer, Southern Pacific Lines in Texas and Louisiana, Houston; and W. H. Huffman, division engineer, Chicago & North Western, Chicago.

Eight subjects were chosen for investigation during the ensuing year. These subjects are as follows:

(1) Restoring and Prolonging Life of Masonry Structures
(2) Fire Prevention through Regular Inspections
(3) Maintenance of Track Scales
(4) Safety Problems of the Supervisor
(5) Developments in Power Tools and Machines
(6) Present Trends in Modernization of Passenger Stations
(7) Methods of Repairs to Steel Bridges and Structures
(8) Inspection and Maintenance of Water Tanks

SECRETARY'S REPORT

of

MEMBERSHIP AS OF SEPTEMBER 1, 1951

Active Members—September 1, 1950		492	
New Active Members since September 1, 1950		69	
		561	
Reported deceased since September 1, 1950	2		
Resigned since September 1, 1950	10		
Transferred to Honorary Members	2		
Transferred to Life Membership	2		
Dropped account non-payment of dues	73	89	
Total Active Members—September 1, 1951			472
Accociate Members—September 1, 1950		125	
New Associate Members since September 1, 1950		13	
		138	
Reported deceased since September 1, 1950	2		
Resigned since September 1, 1950	3		
Dropped account non-payment of dues	18	23	
Total Associate Members—September 1, 1951			115
Life Members—September 1, 1950		93	
Elected to Life Membership since September 1, 1950		2	
		95	
Reported deceased since September 1, 1950	5		
Dropped account mail returned	5	10	
Total Life Members—September 1, 1951			85
Honorary Members—September 1, 1951		3	
Elected to Honorary Membership		2	
		5	
Reported deceased since September 1, 1950		1	4
Total Membership—September 1, 1951			676

September 17, 1951

REPORT OF AUDITING COMMITTEE

TO MEMBERS OF
THE AMERICAN RAILWAY BRIDGE
AND BUILDING ASSOCIATION:

Gentlemen:

We, the undersigned members of the Auditing Committee, have examined the books of the Secretary for the period September 1, 1950 to August 31, 1951, inclusive, and have found them to be correct as of the latter date.

Respectfully submitted,

T. H. STRATE, *Chairman*
A. E. BECHTELHEIMER
B. R. MEYERS
Auditing Committee

Chicago, September 14, 1951

REPORT OF NECROLOGY COMMITTEE

TO THE PRESIDENT AND MEMBERS OF THE AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION:

Your committee appointed to report on the loss by death of members of this Association submits the following:

We regret to advise that we have learned of the loss of a total of ten members not previously reported, including 1 Honorary Member, 2 Active Members, 5 Life Members and 2 Associate Members.

It is to be regretted that in only a few instances and then in response to request, have we received detailed information from friends and associates of deceased members as to their life and activities. In many instances information as to deceased member reached the committee too late to make inquiries. It is probable that other members have passed away of whom we have no information.

HONORARY MEMBERS:

C. E. JOHNSTON (Retired), Chairman, Western Association of Railroad Executives.

Mr. Johnston was born at St. Elmo, Missouri, on October 30, 1881, and entered railroad service in 1897 with the Chicago and Eastern Illinois. Subsequently he was with the St. Louis-Southwestern, St. Louis-San Francisco and Missouri Pacific before joining the Kansas City Southern in 1905 as Locating Engineer. Mr. Johnston remained with the Kansas City Southern for more than 30 years, becoming its President in 1928. He served as Chairman of the Western Association of Railroad Executives.

Mr. Johnston retired in 1948 and passed away at LaJolla, Calif., on July 9, 1951.

TREASURER'S REPORT

SEPTEMBER 1, 1950 to AUGUST 31, 1951

Cash Balance—September 1, 1950		$1,784.09
RECEIPTS:		
Dues	$2,616.10	
Advertising (1949 Proceedings)	1,800.75	
Miscellaneous	118.19	4,535.04
Total		$6,319.13
DISBURSEMENTS:		
Salaries	$ 814.77	
Social Security and Withholding Taxes	122.42	
Stationery and Printing (including 1950 Proceedings)	1,975.94	
Postage	100.47	
Rent, Telephone and Electricity	290.02	
Convention Expense (1950)	283.28	
Miscellaneous	150.47	3,737.37
Cash on hand, August 31, 1951		$2,581.76
ACCOUNTS RECEIVABLE:		
Due from Advertisers in 1950 Proceedings		2,275.00
Total as of August 31, 1951		$4,856.76

L. C. WINKELHAUS,
Treasurer

APPROVED:
T. H. STRATE
Chairman, Auditing Committee

September 17, 1951

Mr. Johnston joined the Association in October, 1911 and was elected to Honorary Membership in October, 1947.

ACTIVE MEMBERS:

W. R. GANSER, Master Carpenter, Pennsylvania R. R., Jersey City, N. J. Mr. Ganser joined the Association in December, 1931. He passed away in 1949.

WILBUR O. NELSON, Assistant Maintenance Engineer, Baltimore & Ohio R. R., Baltimore, Md. Mr. Nelson joined the Association in October, 1947, and passed away during December 1950.

LIFE MEMBERS:

ROSCOE C. YOUNG (Retired) Consulting Engineer, Lake Superior & Ishpeming R. R. Mr. Young was born in Beaver Dam, Wisconsin, on November 21, 1864.

Mr. Young entered railroad service with the Chicago & Northwestern in 1883. After service with Munsing R. R., Copper Rouge R. R., Des Moines, Iowa Falls and Noretun, and Rock Island System, he joined the Lake Superior and Ishpeming R. R. in June, 1904 as Chief Engineer. Upon retirement from this position in December, 1937, he served as Consulting Engineer until December, 1941.

Among other projects, it is of interest that Mr. Young designed and directed construction of the Lake Superior & Ishpeming ore dock at Presque Isle in 1911 and 1912. It was the first concrete and steel ore dock on the Great Lakes.

Mr. Young joined the Association in October, 1923 and was elected to Life Membership in 1949.

Mr. Young passed away on October 5, 1950 at the age of 86. He is survived by his widow, two daughters, a son and three grandchildren.

EUGENE G. DAY (Retired), Chief Engineer, Lake Superior & Ishpeming R. R., Marquette, Mich.

Mr. Day was born at Starks, Mo. on December 22, 1881. After graduation from University of Maine in 1904, he entered railroad service in 1905 with the Minneapolis and St. Louis. After service with the Chicago and Northwestern from 1908 to 1937, he succeeded Mr. Young as Chief Engineer of the Lake Superior and Ishpeming R. R. and served until his retirement in 1948.

Mr. Day joined the Association in 1923 and was elected to Life Membership in 1949. Mr. Day passed away on April 26, 1951.

B. A. QUILL (Retired), Supervisor Bridges and Buildings, Georgia Railroad, Camok, Ga.

Mr. Quill joined the Association in 1901 and was elected to Life Membership in 1943.

In preparing for the 60th Anniversary, the committee endeavored to contact Mr. Quill as it was thought he was one of the two oldest members of the Association. It was learned that Mr. Quill passed away on July 10, 1936.

E. C. NEVILLE: (Retired), Supervisor Bridges and Buildings, Grand Trunk Western Ry., Toronto, Ont., Canada. Mr. Neville joined the Association in 1920. He was elected a director in 1929 and served the Association as President in 1936-1937. He was elected to Life Membership in June, 1941.

Mr. Neville was connected with the Ducite Company after retirement from railroad service. Mr. Neville died on March 11, 1951.

ARTHUR O. RIDGEWAY (Retired) Chief Engineer, Denver and Rio Grande Ry., Denver, Colorado. Mr. Ridgeway joined the Association in 1910. He was elected a director in 1915 and served the Association as President in 1922-1923.

Mr. Ridgeway retired from railroad service and was elected to Life Membership in January, 1949.

We understand Mr. Ridgeway has passed away but have no detailed information.

ASSOCIATE MEMBERS:

W. E. CRAWFORD, President, George Vang, Inc., Pittsburgh, Pa. Mr. Crawford joined the Association in February, 1946. Through his activities as a Railroad Contractor, Mr. Crawford was widely known. Mr. Crawford died on June 26, 1950.

BENJAMIN J. MANY, President, B. J. Many Co., Inc., Chicago, Ill. Mr. Many joined the Association in February, 1956. Mr. Many was widely known in the railroad field. Mr. Many passed away on January 27, 1951.

We deeply regret the passing of these our fellow members and associates. May their memory remain with us. We mourn the loss of these our brethren and express our sorrow to their loved ones.

F. R. SPOFFORD,
Chairman, Necrology Committee

RESOLUTIONS COMMITTEE

The American Railway Bridge and Building Association in convention assembled, recognizing that the special efforts of certain parties should be fittingly acknowledged, does hereby recommend the following resolutions, to wit:

Be it resolved, that the appreciation of the officers, members and guests of this Associa-

tion be expressed to the management and personnel of The Stevens Hotel for the co-operation and hospitality which we have enjoyed.

Be it further resolved, that the sincere thanks of the officers and members of this Association be extended to the Simmons-Boardman Publishing Corporation and its representatives for their efforts in our behalf. The preprints of the committee reports are essential to the full appreciation of the reports. The CONVENTION DAILY is of interest and of value to us all.

Be it further resolved, that the thanks of the officers and members of this Association be extended to Mr. J. P. Canty, Past President, and to Mr. L. R. Morgan, Fire Prevention Engineer, New York Central Lines, for their joint undertaking in presenting a wire recording of Mr. Canty's reminiscences. We regret that Mr. Canty was unable to attend. We extend our best wishes for his continued health and well-being.

Be it further resolved, that the sincere appreciation and thanks of the officers, members and guests of this Association be extended to the officers and members of the Bridge and Building Supply Men's Association and to the Track Supply Association for their untiring and devoted support of the efforts of our Association. The banquet and entertainment will long stand out in our memories.

Be it further resolved, that the sincere appreciation and thanks of this Association be expressed to Mr. J. H. Aydelott, Vice President, Association of American Railroads; to Mr. J. P. Kiley, President, C. M. St. P. & P. Ry. Co; to the Illinois Central R. R.; and to Mr. R. H. Beeder, Assistant to Chief Engineer, A. T. & S. F. and his panel for flood problem discussion; their efforts insured the success of our program.

Be it further resolved, that the thanks and appreciation of the Association be extended to Mr. E. H. Barnhart, Past President, (Division Engineer, B. & O. R. R., Garrett, Ind.) and to the members of his committee for their efforts in assembling and presenting the program commemorating the 60th year of this Association.

Be it further resolved, that the thanks and appreciation of this Association be extended to the officers and employes of the Underwriters Laboratories, Inc., for their co-operation and hospitality in showing our members and guests the facilities and activities of their laboratories.

Your Resolutions Committee recommends that these resolves be spread upon the minutes of the convention so that it becomes a part of our "Annual Proceedings", and that copies of these resolves be forwarded to the parties concerned.

F. R. SPOFFORD, Chairman
R. R. GUNDERSON,
R. E. DOVE,
Resolutions Committee

Abstracts of the addresses by Messers Aydelotte, LaFountaine and Kiley, as delivered before the joint sessions, are presented below.

Economies Needed In All Departments

In his address at the opening session, Mr. Aydelott expressed himself as being somewhat apprehensive that the difficulties facing the railroads in the country's mobilization period "may somewhat restrict the activities of your particular field as time passes." Furthermore, he said, there is a financial problem because of the railroads' failure "to secure an increase in their charges commensurate with additional costs that have been thrust upon them through higher wage rates, increased costs of material and increased taxes." He implied, however, that traffic volume may partially offset these increased costs.

Because the money needed to assure adequate railroad earnings is not to be forthcoming in the required amounts through increased charges to the shipping public, "it will be necessary," said Mr. Aydelott, "for each department of the railroads to secure the utmost in economies in the operation and maintenance of the railroad plant." While material shortages may impose obstacles in obtaining the necessary maintenance tools and machines, "it is hoped," he continued, "that a program of mechanization, which

has had such worth-while results thus far, may be continued, although it may take somewhat longer to get delivery of these machines than heretofore." Mr. Aydelott told his listeners they may depend on the manufacturers of roadway machinery "to work diligently to maintain their normal rate of production, and that we in the A.A.R. will assist them all possible should they find it necessary or desirable."

Mr. Aydelott also spoke of the necessity of making a thorough clean-up of scrap or obsolete material at the end of the maintenance season to secure scrap for the national defense program, and urged maintenance men to motorize their gangs as one way of adding to the productive time. Speaking of the greater efficiency of the railroads, he said that the carriers were operated in 1950 with 440,000 fewer employees than were required in 1929, and said, if these additional employees had been on the payroll last year, the added annual cost to the railroads would have been $1½ billion, or double the amount of their net railway operating income. He then traced in detail the factors behind the improved efficiency of the railroads, stressing the need for continued programs for improving the physical properties.

Importance of Safety

In his address on the Importance of Safety in Track Maintenance, Mr. LaFountaine first outlined briefly the results of a study he had made of progress in accident prevention on the American railroads since 1923. For the purposes of this study, he divided the 27-year period into four parts, namely, that of 1923-1929, which he called a period of peace-time stability; that of 1930-1940, called the depression period; that of 1941-1945, called the war period; and that of 1946-1949, called the present post-war period.

According to Mr. LaFountaine the casualty frequency rate to all employees on duty during the depression period decreased 66.9 per cent in comparison with the peace-time stability period. In the war period, he said, the casualty frequency rate decreased 51.7 per cent as compared with the peace-time stability period, while in the post-war period the casualty rate decreased 58.1 per cent as compared with the peace stability period. He went on to point out that the fatality rate of employees on duty during each of the four post-war years was the lowest in the history of the American railroads, with the year 1949 showing marked progress over the previous years. The maintenance-of-way department, he said, did its full share in bringing about this gratifying accomplishment in the field of accident prevention.

Comparing the casualty rate for employees in various departments, Mr. LaFountaine said that the maintenance of way and structures department has the second lowest casualty rate, but that the fatality rate in this department is more than twice as high as that of the maintenance-of-equipment department. While it is true, he said, that the frequency rate in the maintenance-of-way department has improved markedly over the years, it is still not good enough. Pointing out that during the last five years there has been an average of 164 maintenance-of-way employees killed and 5,505 injured annually, he noted that the majority of the fatalities in this department occurred as the result of train and train service accidents. There are two causes of such accidents, he said, namely (1) the operation of motor cars, and (2) employees struck or run over. In a discussion of motorcar accidents he reviewed the development of two rules relating mainly to the use of train lineups, which were forwarded to the chief operating officers of the member roads of the Association of American Railroads early this year by Mr. Aydelott.

While Mr. LaFountaine doesn't believe that the recommended changes in the motor car lineups will solve the problem, he believes they are "a good place to start." In the many motor-car accidents which he has investigated it was seldom that he "found a case where there was not a rule violation, lack of care, or failure to use good common sense on the part of the foreman or the motor car operator, and which proved to be partly or wholely responsible for the accident." As a means of reducing motor-car accidents he discussed the use of track car indicators, portable telephones, and proper mechanical care of the cars.

Mr. LaFountaine noted that accidents involving employees struck by trains or cars have proven to be the most prevalent cause of fatalities. He said that employees assigned to do work under conditions where they cannot properly protect themselves against movement of trains, engines and cars, should be given protection by assigned employees who are free to do just that one job.

Manpower Must Keep Pace With Machines

Speaking of the great steps that have been taken in mechanizing track - maintenance work, Mr. Kiley, in his address at the joint session on Tuesday afternoon, inquired as to "how many of you could have foretold only a few years ago that practically every step in the laying of rail would some day be done with machinery? Or that stone ballast would be dug up, cleaned and replaced by machines at the rate of a mile or more an hour?" Predicting that there will be even more mechanization in the future. Mr. Kiley then raised the question as to whether "our manpower is keeping up with these mechanical improvements? Is our productivity rising in proper proportion to the railroads' huge investment in labor-saving devices?" In these days of sharp competition with other forms of transportation, he continued, the highest possible productivity is essential to enable the railroad industry to meet—and beat — that competition and maintain the leading position it has always held in the bulk transportation field.

In Mr. Kiley's opinion the work of the maintenance-of-way forces has never been as important as it is at present, and he thinks it will become even more important as time goes on. He went on to point out that railroad track has come to be "a scientifically designed structure, and more and more care is required to maintain it to the required high standard. Our track forces must be equal to this task. The need for capable men to train as foremen perhaps was never greater than it is at present." He urged the associations to make a continuing study of this problem.

Referring to pessimistic comments that men nowadays tend to shirk responsibility and lack the spirit of loyalty, Mr. Kiley commented to the effect that there has always been such men. He firmly believes that "we have young men coming up with just as much capacity for loyalty as the foremen you rely upon today."

Comparative Economies of Materials for Building Exteriors

Report of Committee

COMMITTEE—B. M. STEPHENS, *Chairman,* asst. ch. engr., T.& N.O., Houston, Tex.; JOHN H. BABBIT, *Vice-Chairman*, asst. div. engr., B.& O., Indianapolis, Ind.; L. E. PEYSER, *Vice-Chairman,* arch., S. P., San Francisco, Calif.; R. C. BAKER, supvr. b.& b., C.& E.I., Danville, Ill.; GORDON BURROWS, b.& b. asst. supvr., M.P., St. Louis, Mo.; R. R. CLEGG, dist. sls. mgr., Amer. Lmbr. & Tr., Chicago; J. S. HANCOCK, br. engr., D.T.& I., Dearborn, Mich.; V. V. HOLMBERG, engr. m. of w., Belt Ry. of Chgo., Chicago; P. L. KOEHLER, asst., supt., C.& O., Peach Creek, W. Va.; W. F. MARTENS, gen. fore. b.& b., A.T.& S.F., San Bernardino, Calif.; GEORGE PARIS, rr. repr., Portland Cement Assoc., Chicago; FRED J. STEWART, ch. engr., Port Everglades Belt Line, Port Everglades, Fla.; D. A. WEBSTER, asst. engr., D. & H., Albany, N. Y.; and L. C. WINKELHAUS, arch. engr., C. & N.W., Chicago.

The study of comparative economies of materials for building exteriors is somewhat on the abstract side. The reason for this is the necessary introduction of several modifying and important variables, namely:

(a) The relationship between specified localities and the overall availability of building materials;

(b) Quantity and quality of skilled labor available locally for the application of given types of building materials;

(c) The utility of, or service to which, the building to be constructed or modernized is to be put; and

(d) Certain intangibles applying to appearances and to the purposes to be achieved, as modified by standards of construction peculiar to individual localities and railroad managements.

These variables must necessarily exert an important influence upon the development of any criteria applying to the comparative

economies of materials for building exteriors. This influence, in point of fact, has been found to be such as to make impracticable the development of specific statistical data suitable for unrestricted general use.

Nevertheless, there are certain generalities and fundamentals applying to the matter of comparative economies of materials for building exteriors, which can well be stated in the form of a report. It will be the purpose, therefore, of this report to outline certain precepts which the committee believes can be generally accepted and applied with reasonably satisfactory results, provided they are properly modified where conditions so require.

Four Material Classifications

As a practical matter, almost every type and kind of building or construction material presently known and available to the trade can be used in one form or another for exteriors of buildings. These materials divide into four general classifications, namely, (1) masonry and masonry products, (2) wood and wood products, (3) metals of various kinds, and (4) compounded and specially processed materials.

The masonry group includes such items as common and face brick, concrete blocks, various kinds of building stone (including granite and marble), common and face tile, architectural terra cotta, concrete architectural stone, architectural concrete, opaque structural glass, glass blocks, structural glass-faced masonry units, and corrugated glass sheets.

Wood siding of various patterns and species makes up the bulk of the wood group; although, in certain parts of the country extensive use is being made of cedar and redwood shingles and shakes for siding purposes.

In the metal group, there are galvanized corrugated steel sheets, corrugated aluminum sheets, stainless steel flat sheets, specially molded aluminum siding, specially fabricated galvanized flat steel panels, pre-fabricated metal structures, and porcelain enameled steel sheets, to name the most generally used items.

The specially processed group of materials includes, among others, items such as asbestos-cement siding and shingles, corrugated asbestos-cement sheets, asphalt-impregnated fiberboard covered with finely ground mineral chips, and various forms of stucco applied over wood or metal lath or over masonry surfaces.

Masonry Is Economical

From the standpoint of service life and general overall economy of maintenance, as well as from the standpoint of general overall appearance, masonry construction stands practically in a class by itself. Unfortunately, however, the initial cost of masonry construction is generally at a higher level than that of any of the other types of construction and, in some isolated instances, maintenance costs of masonry construction may also be found to be at a relatively high level.

Within the masonry class itself, there are many different price levels, each level being dependent upon the type of construction and kinds of materials used. Sometimes, therefore, it is necessary to sacrifice service life, and possibly appearance and maintenance considerations to some extent because of the initial costs of construction being beyond the limits of authorizations at hand.

In such cases, dependent upon considerations as to use and occupancy and, possibly, resistivity to fire damage and mechanical wear and tear, metal or asbestos-cement covered timber-framed buildings, buildings built entirely of wood or metal, or asbestos-cement clad steel frame buildings, are usually indicated.

In general, railroad building construction and modernization is limited to such items as passenger and freight stations, shop buildings, miscellaneous small roadway buildings, and general-duty warehouses. Small office, depot and other kinds of buildings must sometimes be provided, but it is not often that construction of major office and passenger and freight-station buildings is necessary. Work involving major buildings is generally limited to the modernization of such facilities.

The selection of materials for new building construction or major remodeling of existing buildings, in a great many instances, is governed to a large extent by building-code requirements. This is particularly true in the larger cities and towns where the more important railroad buildings generally are located in restrictive fire zones. Compliance with code requirements frequently narrows the materials field to the point where there is little choice left between the various items in the above-mentioned general classifications of building materials.

Railroad Standards A Factor

In addition to code requirements, it is more often the rule than otherwise that certain railroad standards have the effect of further restricting the selection of materials to certain types and kinds. Under such situations, in order to develop a comparison of economies of materials, the designer must balance, one against the other, several governing factors as follows:

(a) Utility of, and purpose to be served by, the construction and the effects upon the construction of building-code requirements and railroad standards as to types of materials which can be used.

(b) Availability of materials for reasonable delivery at prices commensurate with final desired results.

(c) Availability of skilled and competent labor as well as costs applying to use of such labor.

(d) Life expectancy of various types of materials available for use, with particular attention being paid to ability to withstand damage, due either to geographic location or use and occupancy.

(e) Determination within reasonable limits as to extent of maintenance required over a period of years from the standpoint of preservation of materials as well as from an appearance standponit.

There appears to be no set rules by which determination can be made as to the proper weight which should be allocated to any one of the factors mentioned. As a general proposition, any given project will most likely be sufficiently dissimilar from any other project so that the arrival at proper weighted average of the factors is largely a matter of experience.

In recent years, the railroads have found it necessary to remodel and reconstruct many railroad buildings, not only for the purpose of bringing them up to modern, progressive standards but also because a large number of the buildings, having been built near the turn of the century, were wearing out and were inadequate for present-day requirements. Also, the rapid changeover from steam power to diesel power by many of the nation's railroads in the past few years has made it necessary that new buildings to house, service, and repair diesel locomotives be provided in many instances.

Guide for Use of Materials

There are about as many opinions applying to methods of procedure and utilization of materials, in so far as railroad building construction and modernization is concerned, as there are railroad architects. For this reason, it is difficult to develop recommendations suitable to all in every respect. As a statement of basic principle, however, the following is suggested as being a reasonably practicable guide in the matter of utilization of materials for building exteriors. The listings given, bearing in mind that varying modifying factors may effect the order one way or another, *are roughly in order of increasing cost.*

I. For large terminals and other relatively important locations and structures.

A. Station and office buildings.

(1) Face brick or unglazed facing tile, with masonry backing of common brick, concrete blocks or hollow tile, from foundation to window-sill level, balance of construction being of concrete block finish by application of stucco.

(2) Face brick or unglazed facing tile, backed up with common brick, concrete blocks, or hollow tile, used throughout the construction.

(3) Pre-cast concrete architectural stone facing, with low-cost masonry backing, or cast-in-place finished architectural concrete walls used throughout or in combination with other types of finished masonry.

(4) Natural cut stone with low-cost masonry backing used in entirety or in combination with other types of finished masonry.

(5) Architectural terra cotta or structural glass-faced masonry units with low-cost masonry backing used throughout or in combination with other types of finished masonry.

(6) Granite veneer, cut granite, or marble facing on concrete or other suitable masonry backing used in entirety or in combination with other types of finished masonry.

B. Shop buildings, storehouses, freight stations, etc.

(1) Concrete blocks, finished with brushed-on Portland cement wash or Portland cement paint, from foundation to window-sill level, balance of construction being of corrugated steel siding, or corrugated aluminum siding, or corrugated asbestos-cement siding

on steel or reinforced concrete framework.

(2) Pre-cast architectural concrete panels erected by tilt-up or other methods of erection, used throughout.

(3) Cast-in-place concrete walls from foundation to window-sill level, in lieu of concrete blocks, with various wall combinations as noted to be used with concrete blocks.

(4) Common brickwork from foundation to window-sill level in lieu of concrete blocks or cast-in-place concrete, with various wall combinations as noted to be used with concrete blocks or cast-in-place concrete.

(5) Concrete blocks finished with brushed-on Portland cement wash or Portland-cement paint, used throughout the construction.

(6) Common brickwork used throughout the construction.

II. For suburban areas, smaller terminals, and less important locations and structures.

A. Station and office buildings.

(1) Timber framing with wood novelty siding of not less than 2-in. thickness up to window-sill level, or other desired height, balance of construction being of rigid asbestos-cement shingles or aluminum novelty siding on solid sheathing of wood or other suitable sheathing material.

(2) Timber framing, solid-sheathed with wood or other suitable sheathing material, finished with lathing and stucco.

(3) Concrete blocks, finished with brushed-on Portland-cement wash or Portland-cement paint, or cast-in-place concrete wall from foundation to window-sill level, balance of construction being of wood novelty siding, rigid asbestos-cement shingles, or aluminum novelty siding on solid sheathing, of wood or other suitable sheathing material.

(4) Common brickwork from foundation to window-sill level, in lieu of concrete blocks or cast-in-place concrete, with various wall combinations as noted to be used with concrete blocks or cast-in-place concrete.

(5) Face brick or unglazed facing tile, backed up with common brick, concrete blocks, or hollow tile, from foundation to window-sill level, balance of construction being of concrete block finished by stuccoing in any desired color.

(6) Concrete blocks finished with brushed on Portland-cement wash or Portland-cement paint used throughout the construction.

B. Shop buildings, storehouses, freight stations, etc.

(1) Pre-fabricated metal buildings on concrete slab, non-insulated or insulated according to use requirements.

(2) Steel framing covered with corrugated steel, zinc, or aluminum siding.

(3) Steel framing covered with corrugated asbestos-cement siding.

(4) Concrete blocks, finished with brushed-on Portland-cement wash or Portland-cement paint, or cast-in-place concrete wall from foundation to window-sill level, balance of construction being of corrugated steel siding, corrugated aluminum siding, or corrugated asbestos-cement siding on steel or reinforced concrete framework.

(5) Pre-cast architectural concrete panels erected by tilt-up or other methods of erection, used throughout.

(6) Common brickwork from foundation to window-sill level, in lieu of concrete blocks or cast-in-place concrete, with various wall combinations as noted to be used with concrete blocks or cast-in-place concrete.

(7) Concrete blocks finished with brushed-on Portland-cement wash or Portland-cement paint, used throughout the construction.

III. Outlying locations and structures of minor importance.

A. Station and office buildings.

(1) Timber framing with wood novelty siding or boxing and batten, framework sheathed or unsheathed according to requirements.

(2) Timber framing with wood novelty siding of not less than 2 in. thickness up to window-sill level, balance of construction being of rigid asbestos-cement shingles or aluminum novelty siding on solid sheathing of wood or other suitable sheathing material.

(3) Timber framing, solid sheathed with wood or other suitable sheathing material, finished with lathing and stucco.

B. Shop buildings, storehouses, freight stations, etc.

(1) Timber framing with wood novelty siding or boxing and batten, framework sheathed or unsheathed as necessary.

(2) Timber framing covered with corrugated-steel or corrugated-aluminum sheets.

(3) Pre-fabricated metal building on concrete slab, non-insulated or insulated according to requirements.

(4) Timber framing covered with corrugated asbestos-cement siding.

(5) Concrete blocks finished with Portland-cement wash or Portland-cement paint used throughout the construction.

It should be understood, of course, that the above outline is to serve only as a means of generally classifying various possible and suitable types of construction.

It should also be understood that it is possible to work out any number of various combinations of the above general types and to work into such combinations, or into the described general classes, certain other items of construction materials, such as glass blocks, corrugated glass, porcelain-enameled steel sheets, mineral-surfaced asphalt-impregnated fibreboard, cedar or redwood shakes, and similar specialties, according to appearance requirements or other considerations applying to any certain structure.

The committee found that country-wide conditions applying to the matter of cost of construction were so varied as between areas, sections and localities as to preclude the presentation of cost data in form suitable for general application or in such form as would not tend to be misleading or confusing to those attempting to make use of this report in connection with specific projects. With respect to cost data, the committee can only recommend that each architect and designer be governed by personal experiences, modified as may be required by local market conditions, both materialwise and laborwise.

DISCUSSION

The discussion was begun by J. A. Jorlett (Penna.) who stated that, when unusual building materials are used, a small stock should be ordered in addition to actual immediate requirements so that replacements of broken or damaged materials can be made. As an example, he cited an instance where 6-in. by 6-in. glazed tile had been used for wainscoting and floor surfacing, and some of the tile over the floorbeams developed cracks and had to be replaced. The few tile left over from the original construction had been thrown away and new ones of the same size could not be purchased.

J. L. Dougherty (W. M.) brought out the fact that because two different shipments may bring building tile of different color shades, it is better to request this material in one shipment. He asked how others replaced broken glass blocks in enginehouses. E. H. Barnhart (B.& O.) stated that he uses these blocks in panels 15 ft. square, placed in wood frames and muntins. In 10 years, he said, only one panel needed replacement and this was because an engine ran through it. President Huckstep said he had found that the use of a high-glazing compound in the original construction made it easier to make future single-block replacements. L. C. Winkelhaus (C.& N.W.) said he preferred to use the heavy wood frames and sash with wood beads for installing glass block because vibration from the engines effects putty and glazing compounds.

J. F. Warrenfells (S.A.L.) stated that whenever he had occasion to replace one broken glass block, two or three others adjoining were broken in the process so that four blocks had to be ordered to replace one. He added that his road is now experimenting with the use of corrugated structural glass for enginehouse end panels. They seem to be holding up better than the glass blocks did and are more easily repaired. He further stated that he prefers the heavy creosoted wood frame for these panels instead of the metal frames. President Huckstep said he was interested in Mr. Warrenfell's reference to the corrugated structural glass because his road has used this material in the construction of a new $2 million freighthouse and finds that it provides good lighting.

Protection of Steel Bridges Against Brine Drippings

Report of Committee

COMMITTEE—M. J. HUBBARD, *Chairman,* gen. supvr. b. & b., C.& O., Richmond, Va.; M. D. CAROTHERS, *Vice-Chairman,* asst. ch. engr., G. M. & O., Bloomington, Ill.; JOHN H. ALLEN, fld. engr., DuPont, Philadelphia, Pa.; A. B. CHANEY, asst. ch. engr. mtce., M.P., St. Louis, Mo.; LEO E. FLINN, sls. & serv. repr., Dearborn Chemical, Chicago; H. C. FRONABARGER, b. & b. supvr., T.& P., Fort Worth, Tex.; N. E. HUENI, asst. engr., M. P. Houston, Tex.; N. W. JOHNSTON, gen. br. drafts., S. A. L., Norfolk, Va.; C. LEDUC, repr., Acorn Refining, Cleveland, Ohio; W. R. MEEKS, supvr. b.& b., M. P., Falls City, Neb.; CURTIS PERRY, asst. supvr. b. & b., C.& O., Ashland, Ky.; C. C. RAUSCH, asst. v.p., Dearborn Chemical, Chicago; W. L. SHORT, br. insp., M. P., St. Louis, Mo.; P. E. SCITES, asst. supvr. b. & b., C.& O., Huntington, W Va.; and R. A. WESTERGREN, div. engr., Penna., Harrisburg, Pa.

Many methods of protection from brine drippings have been tried, some in an experimental way, but there is still a large field for investigation. There are three principal methods for protection of steel bridges against corrosion resulting from brine drippings:

(1) Choice of more corrosion-resistant steels, such as alloy steels, high tensile steels or non-ferrous materials.

(2) Use of protective coatings: (a) Metallic coatings such as zinc or aluminum platings; and (b) other protective coatings and coverings.

(3) Corrosion inhibitors (polyphosphate nitrate mixtures).

Copper-bearing steel increases the corrosion resistance of the steel at only a slight additional cost, but it cannot be considered economically effective against brine drippings without a substantial protective coating. High-tensile steels of silicon or nickel and other alloy elements have been used in some special railway bridges during the past few years with very good corrosion-resistant qualities. These alloys naturally increase the cost of steel considerably and, as with copper-bearing steel, they cannot be considered economically effective against corrosion from brine drippings without a good protective coating.

Metallic Coatings

Metallized coatings, applied to the tops of steel girders by spray-gun process, have been used by some railroads where brine drippings from refrigerator cars cause heavy damage to steel bridge members. This process consists of spraying molten non-corrosive zinc or aluminum on thoroughly cleaned steel surfaces by using a special gun on the order of a spray gun. The non-corrosive metal feeds through the center of the gun's nozzle in the form of a wire. At the base of the gun there are attached three lines—one carrying compressed air, another oxygen and a third acetylene. As the metal wire passes out of the gun through the nozzle, it is transformed into a molten state by an oxyacetylene flame and is forced into a spray by the compressed air. The metal spray is cooled rapidly and is practically cold when it strikes the steel surface being coated, so the bond to the steel is more or less mechanical.

One railroad has made it a policy to metallize the top flanges of floorbeams, stringers and girder spans on all new bridges before erection at locations where subjected to excessive brine drippings.

The surface preparation is one of the most important factors in the metallizing process, especially when undertaken on top of an old girder that has been exposed to brine drippings, causing deep pits in the steel plates. The conventional steel-cleaning processes may be used, such as air tools, wire brushes, sand or shot blasting, and flame cleaning with oxyacetylene torches. Salt deposits in pits and pores in the steel are neutralized by the high temperature of the flame (3600 deg. to 3800 deg. F.), as salt vaporizes at approximately 2600 deg. F.

Other Protective Coatings

Many protective coatings for steel girders

are in use today. Probably one of the oldest and most generally used is linseed oil paints, such as red-lead primers, because of the adherence of linseed oil to steel when covered with a protective paint or coating that will stand normal weathering.

Experience has shown that oil-paint coatings on steel will not withstand excessive dampness, brine drippings, acids, etc., due to the paint films being very porous, and, in order to protect steel from these highly corrosive conditions, it is necessary to use an impervious acid-resistant material for the coating. Such coatings can either be applied direct on the properly cleaned steel or over oil-paint coatings.

Proper cleaning of steel structures before painting is very important in order to insure the best bond of the paint film. If the cleaning and painting can be done before the metal becomes pitted, a satisfactory and economical cleaning job can be done with pneumatic chipping hammers, steel hand scrapers, hand and electric wire brushes and disc machines; however, if the painting has been deferred to such an extent that the corrosion and deterioration is very prominent, then the sandblasting method of cleaning should be used in order to get a satisfactory cleaning job.

All cleaned steel should be given a primer coating immediately after cleaning, as oxidation forms a light rust coating over night on exposed steel surfaces. Red-lead or chromate primers applied in one or two coats, then covered with a coat for weathering, have been used by most railroads for normal protection. Where brine drippings are involved, the painting cycle on portions of girders has to be stepped up for protection of steel, or an added protective coating applied over oil paints to extend the paint cycle.

Spot Painting Satisfactory

Periodic spot painting of bridges exposed to heavy brine drippings has proven very satisfactory as there are portions of girders that will probably run a six- or eight-year paint cycle, yet, to protect other portions, spot painting will be required every two or three years due to local conditions. Corrosion from brine drippings on some railroads runs the cleaning cost up 200 to 300 per cent over bridges exposed only to normal corrosive conditions.

Oxyacetylene flame cleaning has been used to very good advantage by some railroads on bridges where it is desired to remove all the old paint from girders, including the original shop coat on steel. Flame cleaning is not economical on some girders with certain types of paints that are not too old and where a substantial portion of the coating is intact as the flame seems to set the paint on steel, making it very difficult to remove with tools.

One of the coatings being extensively used by a number of railroads is a heavy non-hardening chemically inhibited compound of grease-like consistency, containing a solvent for ease of application. This material is applied with a stiff bristle brush or spray in order to insure a good bond between it and the steel or oil-paint coating. The thickness should be about 1/16 in. applied only on portions of beams or girders where the coating will not be broken, as it is a non-hardening compound.

These materials have found good usage on steel girder plates, tops of floor-beams, laterals, lateral plates, top and bottom flange angles, webs, struts, cross frames, fixed and expansion bearings, roller nest, rockers and finished bearing surfaces; also as a protective coating on turntables, used by steam engines at terminals, as these tables are subjected to an excessive amount of chemically treated water from steam locomotives.

Asphalt coatings have also been used by a number of railroads as a substitute for paint in the protection of steel bridges against corrosion. This material is applied as neat asphalt, put on hot, or in the form of asphalt oils containing from 57 to 65 per cent asphalt by weight, which gives a fairly economical protection from normal corrosion. However, for excessive brine drippings the neat asphalt is recommended, applied in heavy brush coats, as its melting point of 150 deg. to 170 deg. prevents the asphalt from running in hot weather and cracking in cold weather.

Some railroads have given protection to top cover plates on open-deck bridges by the application of tapered or roof-type wood blocks between bridge ties over girders or beams. These blocks are sealed in place with asphalt, tar, or some compound that will shed the brine drippings. Galvanized iron troughs are sometimes used between bridge ties to shed or deflect brine drippings from the tops of beams or girders.

Corrosion Inhibitor

The annual corrosion loss to the railways from the damage done by brine drippings cannot accurately be evaluated, but it has been estimated that the damage to track and bridge structures probably exceeds $8,000,000 annually and the damage to the refrigerator cars is perhaps one-half of this amount.

Extensive tests were undertaken by the Association of American Railroads to find a corrosion inhibitor that could be used with salt when icing refrigerator cars, which would effectively protect the track, bridge and car structures from brine corrosion. The most promising inhibitors tested were sodium polyphosphate and disodium phosphate, the indications being that their use would result in a reduction of approximately 68 per cent in the corrosion rate.

More research must be conducted before definite recommendations can be made for the use of inhibitors in icing refrigerator cars; however, the results of the research work are very promising and indicate that a substantial reduction may be made in the annual corrosion loss by railways due to brine drippings from refrigerator cars, which will save the industry several millions of dollars annually.

Conclusion

Methods of protection of steel bridges from brine drippings are varied and their effectiveness depends greatly upon the character of the structure, local conditions and extent of corrosion. The use of more corrosion-resistant materials will retard the corrosion from brine, and the application of protective coatings, of either metallic or other types, on parts of steel structures, will minimize the extent of corrosion. In the application of metallic or other coatings, a clean dry surface is very essential.

The use of a corrosion inhibitor with the rock salt employed in icing refrigerator cars may, after further study, help solve the problem of steel corrosion caused by excessive brine drippings.

DISCUSSION

Chairman Hubbard began the discussion by announcing that a committee of the A.R.E.A. had been studying this subject for a number of years and is still working on it. He then asked if anyone had solved the problem on his road. L. Garis (C.&N.W.) stated that, while his road had not solved this problem, he did inspect a bridge where the bridge foreman had applied a tarpaper covering over a floorbeam and that after many years of service this floorbeam was in very good condition as compared with other floorbeams not so protected. He added that he recalled where a foreman had sent him two lag screws, one that was galvanized and another that had not been coated, from the same structure. The galvanized lag screw was in excellent condition while the other was of the size of a lead pencil.

It has been the standard practice for 15 years on his road, said F. M. Misch (S.P.), to use galvanized bridge hardware along the seacoast routes.

Chairman Hubbard asked if any members could describe the brine-protection tests being carried out on their roads, and this prompted several members to advise that the A.A.R. is conducting these tests. R. E. Dillow (A.A.R.) stated that he is assisting in making these tests and that, in addition to the galvanized coatings, extensive tests are being conducted with paints. R. Baker (Nat. Lead Co.) said that the problem of protecting steel bridge members with paints had also been referred to his company. As a result several of the more modern types of paints, including vinyl and synthetics, are being tested on several railroads.

W. L. Short (M.P.) stated that he knows of some synthetic paints being used by European railroads but he was unaware of any use of these paints on roads in the United States. He said that sodium chloride, even when merely present in the environment, will cause rapid oxidation of metal. The problem is severe where brine drippings fall, especially in dry territory. In applying paints, Mr. Short believes that the most important factor for obtaining good protection is in the preparation of the surfaces. The film thickness or number of coats is also of importance, because while all coats are porous, each one helps in closing pores in the coat beneath it.

Mr. Short said that there is more than one way to cause rust. Mill scale is not rust in itself, but rust forms beneath it. Rust from salt on iron is hydroscopic and holds moisture to hasten corrosion. Salt must be removed to reduce corrosion, but chipping hammers and scaling brushes won't do it, and some other method must be used. He

has noted that ties resting on girders or steel members cause corrosion, and these places are harder to protect because they are difficult to paint. Hydroscopic rust is in no respect a protective coating in itself. Rusting is rapid in the early weeks of its formation and then it tapers off in growth.

Early in 1929, Mr. Short continued, it was clearly demonstrated that an environment containing salt requires paints with alkaline-resistant vehicles. Synthetic paints look promising but he does not advocate their use in general bridge-work. They should be used only in salt atmospheres and areas. He stated that he was not satisfied with the service life obtained from the coatings now in use on his road, with the exception of the metallic coatings which so far are giving excellent results. He knew that the Northern Pacific was also obtaining good results from metallic coatings. When his road first started using these coatings, it was often expressed that a short service life only could be expected because the electrons of the zinc would be lost to the steel, or wasted. He added that vinyl and chlorinated rubber coatings may be good for sealing the metal surfaces.

Construction of Diesel Fueling Facilities

Report of Committee

COMMITTEE—K. E. HORNUNG, *Chairman,* arch., C.M.St.P.& P., Chicago; G. SWITZER, *Vice-Chairman,* asst. div. engr., W.P., Sacramento, Calif.; H. B. LORENCE, *Vice-Chairman,* fire protec. engr., N.Y.C., Gibson, Ind.; E. T. CROSS, v.p., Armco Dr. & Met. Prod., Middlton, Ohio; L. J. DENO, div. engr., C.& N.W., Escanaba, Mich.; L. C. GILBERT, sen. engr., E.J.& E., Joliet, Ill.; M. JARRATT, w. & f. supvr., S.P., Tucson, Ariz.; A. S. KREFTING, prin. asst. engr., M.St.P.& S.S.M., Minneapolis, Minn.; S. K. MASON, m. of w. engr., Tex. Mex., Laredo, Tex.; J. W. MILLER, pres., W.-M. Corp., Chicago; G. W. NEAL, supt., Chattahoochee Vy., West Point, Ga.; W. C. OEST, prin, asst. engr., Ft.W.& D.C., Ft. Worth, Tex.; WM. H. PAHL, JR., jr. engr., Penna., Pittsburgh, Pa.; E. R. SCHLAF, asst. supt. w.s., I.C. Chicago; JOHN M. SHORT, gen. w.s. insp., T.& P., Dallas, Tex.; and S. R. THURMAN, b. & b. supvr., M.P., Nevada, Mo.

The increasing use of diesel motive power on the American railroads requires continued study to attain the best and most economical methods of storage of fuel oil. The selection and location of tanks and equipment to store this fuel oil is essential. Adequate facilities for delivery of the fuel oil to the locomotives with a minimum of delay are of primary importance. The subject matter of this report will be devoted primarily to the design and construction of fuel-oil facilities.

Design and Planning

The strategic location of fuel-oil installations is closely related to train operations. They are usually placed at intermediate terminals not more than 200 to 300 miles apart for diesel locomotives in freight service. The location of these facilities adjacent to passenger-station platforms will permit their use in servicing passenger-train locomotives while the train is being handled during normal scheduled stops.

The capacity of fuel-oil storage is often limited by restrictions as to the area available for the location of storage tanks, but it is very desirable that the tanks have a minimum capacity equivalent to a 30 days' supply and preferably 60 days.

Another important consideration in the design of the diesel fueling installation is the time required for the fueling operation. The pumps should be adequate to provide a minimum of approximately 100 g.p.m. for each of the units to be serviced simultane-

ously, and the piping should be such as not to restrict the flow of the fuel.

At this point it is well to comment on the mobile fueling facilities provided by a number of railroads for use in servicing diesel switch locomotives assigned to various yards throughout metropolitan areas. Such facilities consist of an automotive tank truck equipped to dispense diesel fuel oil, water and sand. With such equipment, the servicing operation is brought to the locomotive and accomplished during the lunch period or when the engine crew is being changed, with a minimum of lost time to the crew or the engine.

Storage tanks should be of welded steel construction, of gauges to conform to state or local codes. Where such codes do not exist the minimum standards as established by the National Board of Fire Underwriters should apply.

Storage tanks with capacities up to 35,000 gal. are usually prefabricated, since these sizes can be handled as normal shipments and installed with regularly available equipment. Often tanks having a capacity of less than 35,000 gal. can be installed underground more economically than above ground where space may be at a premium and existing structures might require expensive dike or fire-wall construction. Tanks placed underground must be of heavier gauges and provided with some means of ballast to prevent floating. An effective form of ballast is to pour a concrete slab over the top of the tank, providing from one-half to one cubic yard of concrete per 1,000 gal. of capacity, depending on the maximum fluidity of the soil when saturated.

Stability a Problem

The prefabricated tank, when installed above ground, is either placed horizontally on the required number of supporting cradle walls or saddles, or vertically on a crushed stone or concrete base. When such tanks are placed vertically the problem of providing stability under wind loads must be given consideration, and provision made for anchorage if calculations indicate such is required.

Tanks having capacities greater than 35,000 gal. are erected at the site and placed on a bed of well-graded crushed stone and sand extending several feet beyond the circumference of the tank. The area surrounding the tank bed should slope away from the tank to provide good drainage.

Horizontally placed tanks should be provided with a manhole, inlet and outlet coupling, gauge coupling, vent-pipe connection, and level indicator, all these openings to be placed on a line on one side of the tank for top setting. In addition a coupling for a drain and sampling connection, for bottom setting, should be provided on the opposite side near one end.

Vertically placed tanks should be provided with a manhole and couplings for escape valve, vent and level indicator in the roofs. On the side near the bottom should be a manhole, and couplings for inlet, outlet, sampling connection and level indicator. Each tank should also be provided with ladder and safety cage as required.

Dike Protection

The construction of dikes surrounding all above-ground diesel fuel-oil tanks is recommended to protect adjoining railroad property, even though not required by state or local codes. Where multiple-tank installations are made, tanks having a capacity of greater than 25,000 gal. might well be individually isolated by dikes. The volume of the diked area should be 110 per cent of the volume of the tanks, including that part of the tank below the top of the dike wall, unless this requirement is exceeded by state or local codes.

Dikes may be constructed of earth or concrete, and diked areas should not be provided with any drainage other than the natural porosity of the earth.

Pumps of either the centrifugal or rotary types, equipped with totally enclosed motors of such capacity as will develop the full rated discharge capacity of the pump, are used in the diesel fuel-oil service. The centrifugal type pump is very satisfactory for this service when the suction is limited to a relatively low lift, for example, when used to pump from a vertical storage tank to fueling stations. The rotary type pump, equipped with relief valve and by-pass, being of positive displacement, is used where conditions require dome unloading of tank cars, etc., and where self priming is not possible.

To limit the time required to fuel the diesel locomotive to the minimum pumps of at least 200 g.p.m. have been generally accepted as the proper capacity for this service. With proper arrangement of piping and

valves, the same pump may be utilized for conveying the fuel oil tank cars into storage tanks and from storage to servicing stations. Though multiple pumps may be required to facilitate the unloading of cars at the same time locomotives are being fueled, proper piping will prevent fueling interruption due to a pump failure.

Pumphouses and Appurtenances

A pumphouse, of adequate size to accommodate all pumps, filters, meters, piping and valves, should be provided. The pumphouse should be of non-combustible materials with good ventilation and drainage to the outside.

Since Diesel fuel is a very difficult liquid to handle without encountering leaks through gaskets and pipe threads, special attention should be given to the piping. Where the piping is of black steel pipe, the joints should be either carefully welded or screwed, using a specially formulated pipe thread compound to prevent oil leaks. Where pipe lines are of the larger sizes, and cast iron or spiral-welded steel pipe is used, patented bolted joints using neoprene gaskets have proven very satisfactory.

Pipe connections at valves, pumps, filters, meters, etc., can usually be best provided with flanges having gaskets designed for oil service and coated with an oil resisting gasket paste before installation. All pipe lines should be given a hydrostatic test at pressures of 150 per cent of the designed operating pressures. Valves should be of the wedge-gate type having an operating pressure of 125 p.s.i. These valves should have a neoprene or oil-resistant packing. Lubricated plug-type valves are also suitable.

A strainer should be provided in the suction line ahead of the pump, having a 30-mesh removable-type screen to protect the pump from foreign matter. A filter placed on the discharge side of the pump will, if the pump is used for both unloading cars and pumping into the servicing hydrants, provide double filtration of the fuel oil. The filters so used should be designed expressly for this service, with renewable-type filter elements.

Good accounting practice recommends the use of meter installations to record the amount of fuel oil unloaded into the storage tank as well as the quantity placed in locomotive fuel tanks. If the locomotive fueling hydrant outlets are located some distance from the pumping and unloading facilities, meters for the latter purpose should be provided as a part of the fueling hydrants. Air eliminators installed in conjunction with the meter will result in more accurate metering.

Hydrants; Unloading Facilities

There are many variations in the design of diesel fueling hydrants, but the most widely used has a standpipe, 10 to 16 ft. high, with a neoprene hose extending from the top of this pipe and having, on the opposite end, a spring loaded quick-acting type fueling valve and a half-turn quick coupler to fit the diesel fuel tank. The standpipe has a gate valve in line located about five feet above the platform for positive closure. At each standpipe may be located the meter as referred to previously, as well as a pilot-type remote control push-button station for controlling the starting and stopping of the pumps.

Since the National Board of Fire Underwriters has recommended dome unloading railroads are more generally adopting this type of unloading of tank cars. The simplicity of bottom outlet unloading equipment may not outweigh the accompanying hazards.

Where the bottom outlet unloading is used, a pit or box for the storage of hose and for the piping connection is relatively simple in design. The hose used is usually of neoprene with wire reinforcing, and has a standard connection to fit the bottom outlet of the car.

Dome unloading requires a crane, of which there are many designs. Most all of the cranes follow a general pattern consisting of a vertical pipe approximately 10 ft. high located within legal clearance from the center line of the unloading track. At the top of the vertical pipe there is a hinged or swinging joint with a horizontal pipe for extending to the center line of the track. A removable section of pipe for extending the horizontal arm into the bottom of the tank is provided. The removable section of pipe, or arms not counterbalanced, should be of lightweight non-ferrous metals for ease of handling. All swing joints should be of types which provide easy movement and are not affected by oils.

All inside electrical work in connection with diesel fueling installations should be of types to meet the National Electrical Code for Hazardous Installations. Lighting within pumphouses should use explosion-proof type fixtures. Conduit should be of the rigid

type and lighting switches and motor controls, if inside the pumphouse, should be of explosion-proof types. Switch gear, if located on the outside of the building, should be weatherproof. All electrical work should be properly grounded.

As the fueling operations are on a 24-hr. basis, adequate floodlighting of the servicing operations is of utmost importance. Lighting of the tank-car unloading areas is usually of secondary importance as these operations are carried out during the day shift.

As most railroads have their individual requirements as to fire-prevention standards, recommendations in this sphere might be of a controversial nature. However, diesel fuel oil is not in the low flash-point group of inflammable liquids and it is usually sufficient to provide dry-type chemical or CO_2 extinguishers, except where state or local codes require installation of specific types of fire protection, such as built-in foam systems.

DISCUSSION

F. M. Misch (S.P.) began the discussion by pointing out that, in making an inspection of a large fuel-oil storage tank, he found that the bottom plates were paper thin from corrosion and that the heavy deposit of oil sludge no doubt was all that prevented leakage. He warned that it was just as possible to have this corrosion in the pipe lines and that this should be kept in mind when making inspections. He said he differed from the report in one respect in that he preferred to have the tanks set on sand that was oil-impregnated under pressure rather than on gravel or crushed stone. He also warned that economy can be carried too far in re-using old steel water tanks, because when diesel oil is placed in an old riveted steel water tank, there is danger of leakage.

In response to a question by J. A. Jorlett (Penna.) as to how the northern roads kept diesel oil warm so that it presented no pumping difficulties, Vice-Chairman G. Switzer (W.P.) replied that he has found electric heaters to be satisfactory and that they presented no serious fire hazard. H. B. Lorence (N.Y.C.) added that his road likewise uses electric heaters for this purpose and that they are of the explosion-proof type. L. R. Morgan (N.Y.C.) stated that electrical strip heaters would be dangerous to use for warming diesel oil pipe lines, etc., and recommended that the association go on record as being opposed to their use. However, no vote was taken on this recommendation.

L. Mayfield (M.P.) stated that it frequently costs more to make a riveted tank oiltight by welding than to buy a new tank. In welding old tanks, the welded material applied generally breaks as the work progresses. To this, G. W. Benson (C. of Ga.) stated that he has had several old tanks welded but did not experience Mayfield's difficulty with breaks.

C. E. Garcelon (B.&A.) stated that much to his later sorrow he used conventional pipe joints on some of his underground oil supply pipe lines. It was his opinion that pipe lines with conventional joints should be used above ground where they could be inspected for leaks or else welded joints should be used on underground lines.

President Huckstep (M.P.) commented on the lack of anchorage for oil-storage tanks and recounted how such tanks floated away during the floods recently experienced at Kansas City, creating serious fire hazards. He predicted that proper anchorage of oil tanks might soon be required by law. G. Martin (I.C.) said that he had overcome the possibility of tanks floating away during a flood by installing check valves near their bases which permit water to enter the tanks and the levels to become equalized within and outside of the tanks. He admitted that if the water rose to any considerable depth, this anchorage method would cause loss of oil but, on the other hand, if the tanks were not anchored, the oil would be lost anyway.

Economies in Maintenance and Operation of Heating Plants

Report of Committee

COMMITTEE—V. E. ENGMAN, *Chairman,* ch. carp., C.M.St.P.& P., Savanna, Ill; R. W. HUMPHREYS, *Vice-Chairman,* div. engr., N.P., Missoula, Mont.; N. H. WILLIAMS, *Vice-Chairman,* b. & b. mast., D.& H., Oneonta, N.Y.; W. F. ARMSTRONG, arch. drafts., C.& N.W., Chicago; E. H. BARNHART, div. eng., B.& O., Garrett, Ind.; A. E. BECHTELHEIMER, retd. br. engr., C.& N.W., Winnetka, Ill.; W. A. HUCKSTEP, gen. bldg. supvr., M. P., St. Louis, Mo.; J. A. JORLETT, asst. engr., Penna., New York; GUY E. MARTIN, supt. w.s., I. C., Chicago; W. V. PARKER, retd. gen. fore. b. & b., St. L.S.W., Memphis, Tenn.; S. R. THURMAN, supvr. b. & b., M. P., Nevada, Mo.; and JOHN W. ZWICK, asst. w.s. engr., S. P., San Francisco, Calif.

Maintenance and operation of heating plants on the railroads are large items of expense. No doubt there are many old plants in service that are antiquated, and if a study is made it would be found that replacement with a modern plant would be economical from the standpoint of both maintenance and operation. When the 40-hr. week became effective it was desirable to convert coal-burning heating plants to use oil or gas to eliminate the need for manual attendance on week-ends. In many cases the oil or gas-burning unit was installed in the old steam, hot-water or hot-air furnace. The fire box was originally designed to burn coal and it may be questioned if such plants can be operated efficiently with oil or gas.

Economies in fuel consumption may be made by re-arranging piping and installing circulating pumps for hot-water systems and remodelling ducts and installing blowers for hot-air systems. This, of course, is dependent on electricity being available for the pumps or fans. The chimney or stack also has a bearing on fuel consumption and the chimney or stack is also involved at locations where smoke abatement is in effect. It is advisable to check the capacity of the chimney or stack with a draft gauge. Manufacturers generally specify the draft required. It is important that oil-burning stoves have the proper draft.

Insulation Is Important

Another factor in reducing fuel consumption is proper insulation of the boiler and piping, as much heat can be lost if insulation becomes defective. In this connection, the construction of the building being heated has a lot to do with fuel consumption. Obviously, a well-built, properly insulated building will require less fuel to heat than some of the old, poorly insulated buildings in use on the railroads.

Those of us in the northern climates especially know the importance of having the heating plants in a dependable operating condition. The failure of a heating plant at one of the larger places may be costly. Failure can be reduced to a minimum by proper maintenance and operation.

In order that a heating plant may have proper maintenance, the inspection is the first step. Before the heating season is over a visual inspection should be made of steam and hot-water piping, valves, radiators and any other parts that need attention and in which defects cannot readily be detected when the plant is cold. When the heating season is over a thorough inspection should be made and needed material assembled so that repairs can be made before the next heating season. Consideration should be given to the use of welding in connection with repairs. In many cases pipe and fittings and parts for the heating plant can be repaired by modern welding at much less cost than that of new parts.

Guide for Inspection

There are many parts to a heating plant and each part is equally important in the functioning of the plant. The following is a guide for the inspection.

Arrange for a hydrostatic test of all boilers, as state or local statute requires, or as

may be required by the railroad, and wash the boilers. Boilers not requiring a hydrostatic test should be drained and as much as possible of the sludge washed out. It seems that manufacturers could provide more openings in sectional boilers to do proper cleaning and inspecting. Soft water should be used for all steam boilers, especially sectional boilers. Where treated locomotive water is not available, a separate water softener may be desirable. When the boiler is refilled it may be advisable to add a rust inhibitor. Clean the fire boxes and examine the lining and grates and clean and examine tuyeres and retorts if stoker fired.

Clean and examine the smoke-pipe connection to the chimney or stack, the dampers and the barometric draft control. Clean and examine the chimney. A defective chimney not only interferes with the draft, but is a fire hazard.

Examine Stokers

Take apart stokers to examine the feed screw and housing, the gear box, bolts, and hopper, and inspect the motor. Filling the feed screw with oil-soaked saw dust will prevent deterioration of the housing. Painting or oiling the steel portion of the stoker as well as the boiler will prevent rusting.

Take apart, clean and, if necessary, repack the condensate pump, and clean and inspect the motor. The same applies to water circulating pumps in hot-water plants.

Where the plant is an automatic oil-fired unit, clean the nozzle and igniter, and examine the fuel pump and oil strainer. Clean and inspect the motor. Take apart, clean and examine the automatic water feed, and clean the water glass and valves. Test pressure gauges, relief valves and cocks.

Examine radiators, radiator valves, air valve, traps, insulation, pipes and fittings, including the water inlet pipe; also the pressure-reducing valves and motorized valves, including the motor. Open up where necessary for proper inspection. Examine the expansion tank.

Water softeners should be cleaned and examined. Automatically operated plants, in particular, need close attention. Clean hot-air furnaces and examine sections, grates, doors, housing and ducts. Replace air-filter where one is used. Where a blower is provided, examine the bearings and belt, and clean and inspect the motor.

Unit heaters are generally located near the ceiling and are frequently neglected. These should be inspected and motors cleaned and tested.

Coal-Burning Stoves

Coal-burning stoves are easily inspected for defective parts. Many coal stoves have been replaced with oil, gas or electric stoves where heat is required during weekends for patrons, to protect perishable goods, or to prevent plumbing from freezing. About the only attention oil stoves require is the cleaning of the pilot ring and baffle, the oil regulator, the screen and the tub from the fuel tank. If the unit is heavily fired the pilot ring and baffle may burn out. Trouble from foreign substance in the oil can be prevented by installing a sediment bulb next to the fuel tank if the oil is stored in an outside tank. Savings can be made in fuel by providing thermostat control for the oil regulator and a fan for circulation. Where the heater is located in the waiting room of a depot that has to be kept open when the attendant is not on duty, trouble from outsiders regulating the valve can be avoided by placing the oil valve in the office or constructing a cage around the valve, which can be locked.

Inspection of the various electric motors should include wiring, and all electric controls, switches, starters, stack and temperature switches, float switches and thermostats. For uninterrupted service of a heating plant, the electric controls are perhaps the most important. Cause of failure of an automatically controlled heating plant is most frequently of an electrical nature.

Hot Water Heaters

There are many domestic type hot-water heaters on the railroads and they come in the same category as heating plants. These units should have the same thorough inspection as the heating plants. No doubt some economies can be effected by replacing coal or oil heaters with modern gas or electric water heaters. Where electric water heaters are used it is imperative that the heating element be removed and cleaned periodically to maintain its efficiency. Encrustation may build up on the unit to the extent that it will be difficult or impossible to remove the unit without damage.

Heating plants are always a fire hazard from various causes. Where the heating plant is housed in a separate room the fire hazard can be reduced by lining the room with fire-resistant material, keeping the room clean and free from combustible material and providing dependable fire extinguishers. Where oil is used, provide foam, dry powder or CO_2 type extinguishers. Where the heating plant is located in an open room good housekeeping should prevail. If the plant is properly installed and insulated and the room kept clean, the fuel and ashes handled carefully, and drafts regulated so the unit does not overheat, the fire hazard is reduced to a minimum.

Fuel Storage

The storage of fuel oil is a problem in many places. Where space and regulations permit the storage tank should be located above ground. The use of oil heating is quite universal and truck delivery of oil is available in cities and small towns. Consequently, a tank above ground, with a capacity that does not require a dike, can be used. The objection to an underground tank is that it is not accessible for inspection and, if a leak occurs, serious consequences may result from the oil seeping into the ground. Furthermore, water from the ground may get into the tank.

With the mounting cost of fuel, the economical operation of the heating plant is of utmost importance. If, by careful firing and elimination of unnecessary heat, we could save one ton of coal or 100 gal. of fuel oil for each heating unit during one season, the money saving can readily be figured.

Overheating causes waste of fuel, and is detrimental to the heating plant, adds to the deterioration of the interior decoration of the rooms and is a fire hazard. Rooms are often heated to 80 deg. or more when 70 or 72 deg. would be comfortable. With hand-fired coal-heating plants the tendency is to overload the fire box to save extra trips to the coal bin, the grates are not shaken, clinkers not removed and the ash pit not cleaned, all of which result in unnecessary fuel consumption. For successful operation of stoker-fired heating plants the clinkers must be removed regularly. Holding water in boilers to proper level adds to the efficiency of the plant. Oil or gas-fired heating plants are adapted to closer regulation than coal fired. When equipped with thermostatic control or manual control, the temperature can be lowered during nights and week ends when the building is not occupied.

Efficiency can be obtained in the operation of heating plants if the operator of the plant has full knowledge of how they should be operated. The printed instructions furnished by manufacturers, supplemented by such instructions as may be issued by the railroad, should be posted at the heating plant. Officers and supervisors should insist that these instructions be obeyed. We must educate the railroad employee to become fuel-saving conscious—that fuel, whatever it may be used for, is not a cheap commodity to be wasted.

DISCUSSION

President Huckstep opened the discussion by asking if anyone had figured out how to turn cold water into a hot boiler that had no water in it. When no one in the audience responded, Mr. Huckstep said he guessed that the automatic feedwater system is the only solution.

In response to a question raised by R. E. Dove (R.E.& M.) as to whether or not any saving resulted from turning the thermostat dial down at night when the walls had to be reheated the next day, Chairman Engman replied that there was, providing that the dial was not set lower than 60 deg. at night.

G. S. Crites (B.& O., retired) stated that the matter of standardizing furnaces used to heat small buildings is important as it will save in the cost of storing replacement parts.

Accident Prevention in Maintenance and Use of Work Equipment

Report of Committee

COMMITTEE—R. L. Fox, *Chairman,* div. eng., Sou., Alexandria, Va.; E. L. Collette, *Vice-Chairman,* div. eng., St.L-S.F., Fort Smith, Ark., F. F. Hornig, *Vice-Chairman,* div. eng., C.M.St.P.& P., Mason City, Iowa; E. H. Blewer, asst. supt. of safety, N.Y.C., New York; W. H. Begeman, b. & b. supvr., M.P. Jefferson City, Mo.; W. W. Caines, supvr. b. & b., C.& O., Huntington, W. Va.; Jos. M. Biles, asst. engr., M.P., St. Louis, Mo.; W. C. Harman, b. & b. supvr., S.P., San Francisco, Calif.; C. L. Hawkins, asst. mast. carp., Penna., Pittsburgh, Pa.; R. D. Hellweg, asst. div. engr., G.M.& O., Bloomington, Ill.; A. C. Jones, b. & b. supvr., Sou., Birmingham, Ala.; S. H. Shepley, asst. ch. engr., E.J.& E., Gary, Ind.; F. R. Spofford, asst. div. engr., B.& M., Dover, N. H.; and T. M. Von Sprecken, asst. to ch. engr., Sou., Washington, D. C.

In considering the problem of accident prevention prior to any undertaking, regardless of its size or type, there are two goals which must be achieved to insure safe completion of the job. They are: (1) the education of the workmen and the machine operators: and (2) an experienced and intelligent supervisory force. The extent to which these men are trained will determine the safety record for the job.

The education required for the workman is on a very broad and continuous basis. The workman must recognize the importance of his own personal safety, the safety of his fellow workmen, and the safety of the public. The phrases "Safety is the first importance in the discharge of duty," and "Obedience to the rules is essential to safety," are both familiar to every railroad man. Unfortunately, these phrases are so familiar they only remind each man that he has read the General Notice in the Book of Operating Rules. The underlying idea behind these phrases does not strike each man personally as effectively as is should, as far too often men allow themselves to feel that the phrases are meant for the other men, with the result that they treat them indifferently themselves.

First Educate Workman

The first step in educating the workman is to impress him with the realization that he himself can have an accident. He must be able to picture himself disabled and the tragic results to his loved ones. He must realize the importance of working safely and that through a careless act or unnecessary chance he can not only injure himself but his fellow workmen, or someone not even connected with the railroad. With this idea firmly established, he will automatically become more safety minded.

But being safety minded is not enough. Many an accident is the result of ignorance in the use of materials, tools and machinery. This is the second part of the education of the workman. A man must be taught the safe way to use his tools and how to handle material without hurting himself or someone else. He must be taught how to keep his tools in good working condition and how to recognize when these tools are in such a condition that their use would create a hazard.

Must Know Machine

A machine operator must know every aspect of his machine—its capacity, proper maintenance, operating signals, and safety regulations—as well as have practical experience in its operation. Consequently, through experience and training the workman gains confidence in himself and his fellow workmen. This confidence is very necessary, for a man cannot be completely safe if he has to hesitate or if there is a doubt in his mind that he is not doing the job right.

The state of mind of the workman is likewise important. He cannot work safely if his mind is not on the job, nor can he be safe if he becomes overconfident. The foregoing reasons obviously bring out the second essential point in accident prevention—proper supervision. The supervisory forces

must not only educate and train the men in safety and practical know-how of the job, but they must also take a personal interest in the men to such an extent that the work will be assigned according to the ability and aptitude of the workmen. A man must not be put on a job beyond his physical or mental ability. Likewise, he must not be put on a hazardous job if he has any personal problem which would divide his attention.

The foreman or supervisor must himself be well versed in the know-how of the job. He must be thoroughly acquainted with the capacity of the machines and their safe load. He must supervise the actions of the men regardless of their experience, as they may become careless or take a chance, and by so doing the risk of an accident is increased. It is the responsibility of the supervisory force to prevent any such action and to inspect the tools and machinery to see that they are in proper condition. It is particularly important to check such parts that wear readily and parts that are under excessive strain. The organization of the work and the mutual understanding of what is to be done are the major responsibilities of the supervisor. With good organization the work will progress more smoothly and, as a result more safely. Equally important is the understanding among the men as to what is to be done and in what order. Closely related to this subject is the mutual understanding of signals, particularly where their use is required involving movement where vocal instructions are not understandable due to the noise of machinery or local conditions.

Must Have Safe Machines

A man may be the best trained both in ability and safety and have the closest supervision, yet he cannot be any safer than the most dangerous tool or machine that is at his disposal. In this respect, the responsibility moves up the line to the purchasing and testing departments. When buying machinery, it is not only necessary to investigate the resulting production and the maintenance cost incurred by the machinery, but it is absolutely necessary to investigate the hazards in its operation. The test department should provide information, if it is not already provided by the manufacturer, as to its proper lubricant, and specifications for replacement parts, and also designate points of excessive stress that should be inspected periodically. The most efficient yet the safest machine must be bought, and the hazards incurred in its use and maintenance must be brought to the attention of the men and supervisory forces.

Safety and accident prevention comprise a field in themselves. Yet this field is interrelated with every department of the railroad. To discuss the problem of accident prevention in any one phase will undoubtedly bring in topics of other fields, yet accidents can be traced back to parent causes regardless of the department. On the surface each accident is different, and the remark is often heard afterwards: "I never saw anything happen like that before"; but regardless of where or when or under what circumstances it may happen, if you go back far enough you will find that it resulted from one of several simple mistakes.

The most common mistake that occurs is in the personal protection of the men. The mistake usually involves just a little thing that would protect a man from being injured. One of the most frequent types of injury to the workman is caused by dropping material or equipment on his feet or hands. Although the cause is probably due to improper handling, the injury could possibly be prevented in the case of his feet, for example, if the man were wearing safety shoes.

It is the desire and goal of every management to remove the cause of accidents. Even though progress is being made in this direction, accidents are still happening. Yet with the safety measures provided today, it is possible to reduce the injuries from these accidents. For example, goggles should be provided for workmen engaged in using welding or grinding equipment. Masks should be provided when entering tunnels after blasting to protect the men from any fumes that might remain in the tunnel; likewise, they should be provided for men engaged in painting with a spray gun in order to prevent inhaling the mist of paint.

Head Protection Needed

Helmets are also necessary equipment where there is a chance of material, tools or rock falling on the workmen. This is particularly true when they are engaged in tunnel work where men are continuously working above each other. This is likewise true in steel bridge construction where there is a constant danger of falling objects.

Another type of injury that is all too frequent occurs as a result of falls. In most every type of construction or maintenance work connected with the B&B department the workmen must place themselves in precarious positions to perform their work. In every case it is necessary to provide equipment for their protection. In some cases a safety belt will be sufficient, but in the majority of instances it will be necessary to build staging or scaffolding. This is true in such cases as tank, bridge, and building construction or maintenance. In building these scaffolds the particular job must be considered in selecting the materials and in determining the size and strength. It is necessary to make the platforms large enough so the men will have sufficient room to work without interfering with the other men. It must also be large enough to handle the material and machinery necessary for the job. In this connection, it is essential to construct the scaffold or staging strong enough to hold any load that might be required in the course of the construction, including wind stresses. To insure the safety of the workmen, railings and toeboards should be included on the scaffold.

The weather conditions must be considered in this type of work. In windy or icy weather special care should be taken to insure the safety of the workman. With high winds blowing, materials and tools may be blown off and there is a constant danger of a man losing his balance and falling. Ice presents somewhat of the same problem in that the footing and hand grips are insecure. Shoes with spikes to prevent slipping are sometimes useful, but if the weather conditions are considered bad enough it is wise to discontinue such work until these hazards are gone. However, it is found that good working conditions such as good light, heat (when possible) and protection from the wind, promote better relations and better safety records.

Tools and Machinery

Through the use of machinery and power tools the railroads have increased the quantity and the quality of their work. Equally important is the fact that these tools and machines have increased the safety of the men working on the job, but if these machines break down or are in bad condition, the efficiency is greatly reduced. Likewise, if this condition is allowed to remain, it comprises a deterrent to the safe operation of the machine. Consequently it is necessary to make daily inspections of the machinery before it is put into operation. This is true of every tool or machine used, and particularly of heavy equipment such as cranes, pile drivers and draglines. The operator should take a personal pride in his equipment and see that every part is in working condition and that there is no point that is liable to fail during its operation. For example, on such equipment as cranes or draglines, connections on mechanical parts must be checked. All bolts, nuts and cotter keys must be tight and in place. Pins must be inspected and sheaves must be free from defects or worn flanges and properly aligned to prevent excessive wear on the cables. The cables should be given special attention. All kinks and twists should be avoided, and proper lubrication maintained at all times, particularly on reserve cable retained on the drum.

Avoid Overloading

Adequate inspection of the machinery involved should also be made, with special attention given to the gears and brakebands. In the actual operation of the machine, care should be taken, by consulting a capacity chart, to see that no part is overloaded, and that no excessive strain is placed upon the cables or boom by too rapid application of the brakes while the boom is extended. If the loads are large, the boom must be handled with care in order to prevent overturning the crane. If there is any particular danger in this respect, the crane should be blocked and equipped with outriggers. Workmen engaged around these machines should take particular care of swinging loads and always keep themselves clear of the machine. In the use of the pile driver, the operator or supervisor should see that the hammer is placed correctly in its leads and that the workmen are clear during this operation.

In the case of track cars and motor vehicles an inspection is also necessary before their use. Each railroad has its own regulations concerning their maintenance and operation, but the difficult part of this situation is in the enforcement of the regulations. In order that the most economical and safest use be made of those vehicles they must be maintained correctly, and this point should be stressed upon the operators. For example, the oil must be changed at the proper intervals, the vehicle greased as specified, and the

proper use emphasized. Excessive speed must be avoided, overloading prohibited and, last but not least, the machine must be kept clean. In the operation of track cars two things must be emphasized: (1) the proper inspection must be made of such things as rail sweeps, wheels, brakes, wheel flanges, gasoline leaks, and especially flagging equipment; and (2) when occupying the main line a line-up must be obtained and sufficient time allowed to clear all trains. In this case especially the rule "Obedience to the rules is essential to safety" must be observed.

In the use of power tools, such as chain saws, augers and wrenches, the main precaution to be considered is the proper footing of operator while using the tool. Equally important is the proper hold on the tool, for if it should stick or jam while in operation it could either throw the operator off balance or pull from his hands, which could result in a serious injury to the operator or his fellow workmen. Another "must" in the use of power tools is that they should not be left unattended, as they could present stumbling blocks for the workmen, or they could be knocked off and injure a workman. But the most essential things that must be done with any type of machinery are: (1) daily inspections, (2) proper training and experience of operators, and (3) close supervision.

Safety of Trains

In the construction or maintenance of structures in or near the main line, one thing must be kept in mind at all times and that is the operation of the trains. First, if the track structure is weakened in any way or obstructed so that maximum authorized speed cannot be maintained, flag protection must be provided and slow orders issued when needed. The track itself, if not fully supported, must be well blocked or cribbed to permit the safe passage of the trains. When working on double track, special attention should be given to see that the opposing track is not obstructed, particularly when using a crane which might extend over the track.

When using a locomotive crane or similar on-track equipment, it is thus necessary to flag in both directions and allow a train to pass only on proper signals. At the approach of a train the boom must be in line with the track. All material and equipment must be moved to proper clearance before a train is allowed to pass. In handling material there is always personal danger to the workman in that he may strain his back or permit heavy material to strike or fall on him. In this respect, certain rules of practice should be kept in mind. First, if a crane is available and suited for the job, it should be used, but care should be taken to see that the load is balanced when lifted. For example, when using tongs to lift heavy timber or rail, the tongs should be fastened at the center to acquire a good balance, thus removing the danger of slipping or excessive swinging. If the material is being loaded in cars, care should be taken to see that it does not crush someone against the car and that the workmen's fingers are not caught between the car and the material being loaded. However, if a crane is not available, a sufficient number of men must be present to lift any heavy object.

In loading or unloading heavy equipment from cars the ramp should be well cribbed and the car securely chocked to insure a firm foundation for the machinery. If such work is carried on at a point which could interfere with the trains, flag protection must be provided.

Protecting Safety of Public

In any type of work the safety of the public must be regarded as of first importance. If there is a possibility of objects falling, such as tools or materials, a railing should be constructed around the work at a sufficient distance to protect the public. However, if local conditions exist where there is restricted room, a covered passageway should be constructed. If weather conditions are extreme and ice will form readily, any waste water covering walkways should be covered with salt, sand or ashes to prevent slipping. Tools and material should be placed so that they will not interfere with the workmen or the public, and, at the completion of the day's work, everything should be put away. This is particularly true in regard to ladders providing access to scaffolding in order to prevent trespassers from climbing up on the staging.

Good housekeeping is not only essential for the safety of the public but also equally important for the safety of the workmen. Waste material should be cleaned up and tools kept out of the way or in tool boxes when not required. A large majority of acci-

dents are caused by failure to keep the working area clean from debris, thus creating hazards for the workmen. Fire prevention is likewise important, and gasoline leakage should be checked regularly. Open flames must be kept away from gasoline storage and engine fuel tanks. Oil on the floors not only creates a fire hazard, but will also present the danger of slipping and should be removed or covered with an incombustible or fire-resistant absorbent compound. Likewise, oily rags or waste should be burned or stored so that they will not present a fire hazard.

Make Dependable Repairs

The problem of proper inspection of equipment before use is very important, but to find the defect is only half of the job. The repair job must be done as soon as the defect is discovered and as quickly as practicable in order that the machine will be out of operation a minimum length of time. Some maintenance jobs can and should be done in the field, but only if the correct replacement part is used. Many accidents are the result of makeshift repair jobs. Consequently, if the specified part is not available, operation should stop until proper repair is completed. Certain major repair jobs are only undertaken in maintenance shops. Here a planned program should be set up to progress the repairs to the equipment as fast as possible in order that it may be returned to duty with minimum delay. This is a very important point and cannot be overemphasized, as the promptness of return will not only increase the efficiency of the machine but will also remove any hesitance on the part of the supervisor in shipping defective equipment.

In the shop itself every precaution should be taken to prevent personal injury by using all safety devices at the workman's disposal. Working conditions should be kept constantly in mind. Such important factors as proper lighting, sufficient room and clean surroundings should be available.

Conclusion

The general concept of accident prevention and safety must begin with the management. Each workman should realize that it is the sincere desire of his superiors to prevent accidents, yet he must also realize that unsafe practices are grounds for disciplinary action. The idea of working safely must be emphasized. This is readily accomplished by posters, safety contests and safety meetings. Safety meetings for the workmen are not enough, and the supervisory forces should have separate meetings at regular intervals and be trained in the safe use and technical knowledge of their work equipment. Consequently, through the medium of proper training, close and intelligent supervision, and prompt and accurate maintenance the goal of accident prevention can be achieved.

Foremen and other supervisory officers should never lose sight of the fact that when they were selected for the position they fill, one of the most important qualities they were considered to possess was ability to plan work and supervise workmen with a high degree of safety. Therefore, they owe it to themselves and those who selected them for their position to periodically take inventory to determine if they merit this confidence.

DISCUSSION

J. E. Griffith (Sou.) stated that scaffolding must be built and kept tight and that the scaffolding apparatus should be inspected frequently. He cited an instance where a scaffolding hook broke, resulting in two workmen being dropped into a river. He added that cables do stretch and described how, after a half day's operation following the rerigging of a locomotive crane, the smaller diameter of the stretched cable allowed it to slip out of the blocks and caused some injuries. G. S. Crites (B.& O., retired) warned that the superelevation of curves must be given careful consideration when operating locomotive cranes on curved track.

Developments in the Use of Laminated Timbers

Report of Committee

COMMITTEE—G. W. BENSON, *Chairman,* supt. br., C. of Ga., Macon, Ga.; H. M. DICK, *Vice-Chairman,* mast. carp., Penna., Harrisburg, Pa.; J. M. LOWRY, *Vice-Chairman,* br. engr. and insp., T.& N.O., Houston, Tex.; R. H. BESCHER, mgr. tech. dept., Koppers Co., Orrville, Ohio; C. MILES BURPEE, v. p., Simmons-Boardman Pub. Corp., New York; FRED D. DAY, mast. carp., Penna., Pittsburgh, Pa.; R. L. FLETCHER, struct. engr., Timber Engineering Co., Washington, D. C.; W. R. JACOBSON, asst. engr., M.St.P.& S.S.M., Stevens Point, Wis.; H. J. LIESER, asst. rdm., Belt Ry. of Chgo., Chicago; J. F. SCHEUMACK, asst. b. & b. supvr., T.& N.O., Houston, Tex.; A. P. SHELTON, b. & b. supvr., Sou., Atlanta, Ga.; C. U. SMITH, constr. engr., Lindsay, Calif.; D. J. WHITE, asst. engr., N.Y.C.& St.L., Cleveland, Ohio; and W. E. WILSON, b. & b. engr., International of Cent. Amer., El Salvador, Cent. Amer.

Two general types of laminating timber are under test and in use today. These are the glued, laminated members and the bolted connector-type of laminating. There appears in the 1947 proceedings of this association a report on glued, laminated members in bridges. Later information on the installations covered in that report, with data on installations made subsequently, is given in the following.

Test Installations

During October, 1944, the Texas & Pacific installed, as a test of service, 11 glued, laminated 7-in. by 16-in. by 14-ft. stringers in a standard ballasted-deck pile bridge on its main line near Woodlawn, Tex. An inspection of the stringers was made in December 1949, some five years after the installation was made. At that time there were no signs of delamination and the stringers appeared to be in perfect condition.

In 1946 the Southern Pacific constructed a two-panel ballasted-deck pile trestle at Bridge 643.71 near Durnid, Cal., in which 3 laminated caps and 14 laminated stringers were used. The materials used in the caps and stringers was kiln-dried Douglas fir of 2-in. nominal thickness dressed to 1⅝ in. The finished caps were 13½-in. by 14½-in. sections and were built up to 9 horizontal laminations, each lamination consisting of two boards 4¾ in. and 8¾ in. wide. The edge joints were pre-glued and staggered in each lamination. The finished stringers were 7¼ in. by 17¾ in. by 30 ft. long, requiring 11 horizontal laminations of the 1⅝-in. thick lumber. Splices in the laminations were made by means of 18-in. scarves. The bridge receives frequent inspection and at last report (summer of 1950) the caps and stringers were performing satisfactorily.

An installation on the Southern near Alexandria, Va., made in October, 1945, consists of 6 stringers, 8 in. by 16 in. by 27 ft.; 4 caps, 12 in. by 14 in. by 13 ft.; and 16 posts, 12 in. by 12 in. by 12 ft. long. An inspection of these timbers made in October 1949 disclosed that, in general, all of them were in excellent condition, with little checking of the timbers or bleeding of the creosote, and only slight openings in the glued joints (similar to small checks) at a few places.

The first installation made on the Chesapeake & Ohio consists of two beams 24 in. by 15 in. by 16 ft. long, laid flat, and installed in a bridge near Newport News, Va., in 1946. These stringers were in good condition in the spring of 1950, with the exception that the top 2-in. by 8-in. member in one of the stringers showed evidence of decay. The defect was noted to a lesser degree when installed and evidently was in the wood when laminated.

The second installation on the C.& O. was made in the latter part of 1946 in Bridge 312 near Ameagle, W. Va. This installation consisted of 8 stringers 7½ in. by 16 in. by 14 ft. long, laminated from 2-in. by 8-in. No. 1 Douglas fir pieces, dressed to 1⅝ in. by 7½ in. The glue used was phenolresorcinol resin glue, and the timbers were treated with a fire-retardent salt by the full-cell process. An

inspection of these stringers in the spring of 1950 found them in good condition and with no defects apparent.

Ties Not Too Good

Experimental oak ties were installed by the Pennsylvania as a test. These were 7-in. by 9-in. members in which the glue lines were vertical. The center laminations in these ties were full length but the outer pieces were applied only under the rail bearing, giving the tie a dumb-bell shape. All were glued. In addition, a portion were fastened with drive screw-dowels, and some with patented fasteners. The ties held with screw dowels were the only ones not showing delamination a year later. Some of the failure of this group of test ties may be attributed to the fact that the design places spike holes in the glue lines, causing the spikes to contribute to the tendency to split.

Literature on Subject

The Forest Products Laboratory at Madison, Wis., has made extensive investigations of both full-size and test specimens and has published results of experiments in Bulletin No. R1789, "Summary of Information on Gluing of Treated Wood, 1950." This laboratory's extensive investigations are further covered by Bulletins D1635, "Laminating of Structural Wood Products by Gluing"; R1687, "Tests of Glued Laminated Wood Beams and Columns and Developments of Principles of Design;" Technical Bulletin No. 691, "The Glued Laminated Wooden Arch"; and "Studies of Strength of Glued Laminated in reprints of A. S. T. M. Bulletin No. 170, Construction." In addition, the laboratory has compiled a list of nine firms which are equipped to produce structural glued laminated members.

The Forest Products Laboratory of Canada has also conducted extensive investigations, and its results are published in Mimeo 113, "Strength Tests of Glued Laminated Beams"; Mimeo 0-152, "The Construction and Testing of Glued Laminated Arch of 47 ft. Span"; and in a reprint entitled "Radio Frequency Bonding of Laminated Beams."

More Railway Ties

Among other experiments this laboratory has also done some experimental work on laminated railway ties. Two or three years ago it constructed 32 ties using resorcinol glue and high-frequency curing. The ties were built up of pine and yellow birch. Only the top lamination was of birch, and the purpose of the birch was to increase the resistance of the ties to plate wear. The ties were installed in track of the Canadian Pacific, along with solid control ties, and are being inspected at yearly intervals. The ties were pressure creosoted after gluing and boring for track spikes.

Publications of both of the laboratories mentioned above contain recommended practices and specifications. In addition, the Southern Pine Inspection Bureau has published a pamphlet entitled "Standard Specifications for Structural Glued Laminated Southern Pine."

Use of Bolted Connectors

The bolted-connector type of laminated timber was introduced into the United States from Europe by the National Committee on Wood Utilization and the U. S. Forest Products Laboratory, and has been sponsored by the National Lumber Manufacturers' Association since 1933.

The connectors are of various forms and are placed in the contacting faces of the laminations for the purpose of transferring the load between the members. The connectors are either placed in pre-cut daps or are forced into the timber by pressure. Bolts passing through the timber connectors hold both the connectors and members in place. The Central of Georgia was one of the first railroads to experiment with bolted laminated timbers. In 1942 this company constructed and placed in service 6 test caps, and in September 1949 an additional 25 such caps. The grade of lumber used for the individual pieces, which were 3-in. by 14-in. members, was dense southern yellow pine, which were sized to 2¾ in. by 13¾ in. and bored before treatment.

The laminations in the completed cap are placed edgewise, and selection of this size member gave a completed cap of 13¾ in. by 13¾ in. in section, which is nearly the same as solid 14-in. by 14-in. caps and permits better bolting of sway bracing on to the piles and caps. These are used as needed for repairs on five-pile open-deck trestles on heavy freight and passenger lines. Clamping plate connectors are placed between laminations at the bolt holes. Three different arrangements are under test. A homemade jig with pres-

sure applied by six 35-ton hydraulic jacks was used to press the laminations together, imbedding the teeth of the connectors into the timbers and assuring proper seating of the connector plates.

Drivespikes Through Connectors

The Atchison, Topeka & Santa Fe has developed a standard procedure for "Maintenance of Ballasted Deck Trestles." This is based on a complete inspection of each structure to determine what handling is in order for individual panels or the entire bridge. Strengthening of the members to be repaired is done by applying a 3-in. by 8-in. by 14-ft. scab to the bottoms of the stringers, using drivespikes through a connector in a pre-cut dap. The caps have a 4-in. by 12-in. by 14-ft. piece bolted on each side, with connectors in pre-cut daps between the cap and the new scabs. This method is said to be rapid, efficient and economical. It requires only the tools used by ordinary bridge gangs, plus a special tool for making the pre-cut daps for the connectors.

This method can be used to make members of any size. It was used to construct the building having the largest uninterrupted space of any wood building to date, namely, one of about 20 blimp hangars built throughout the country. On the exterior this building is 296.5 ft. wide, more than 170 ft. high, and 1058 ft. long. The uninterrupted clear interior space is 237 ft. wide by 156 ft. high by 1000 ft. long. A 15-story apartment house could be erected beneath its roof. The largest piece of timber used in its great arches is only 6 in. by 14 in. in cross section.

Comparing the Two Methods

It is interesting to compare the two methods of lamination. An elaborate plant must be set up and special equipment used to control conditions of temperature, moisture and pressure of glued members, whereas only a simple inexpensive setup such as that described above in necessary in bolting laminations. Highly trained technical personnel is required in handling glued members. No special training is required in bolting.

No glue has yet been found that is completely satisfactory in adhering to creosoted timber although some success has been attained in gluing woods treated with other preservatives. The preservative has no effect when the laminations are bolted and its uniform distribution throughout the member is assured.

The shrinkage due to drying, or the elongation along the grain of the glued members when wet, is a serious problem, whereas there is no adverse effect from this condition of moisture on bolted members.

Glues must be carefully chosen, which are compatible with the type of wood to be used, but the bolted-connector system works equally well with any type. Smaller members can be made by gluing and these can be efficiently spliced by scarfing to form beams limited in size only by the ability to apply proper pressure.

The bolted-connector type will in general be found simpler, cheaper, and, of course, is the only type that can be adapted to field erection or repair. The beam produced will be comparatively as effective as the glued member.

Gluing has been attempted only on a semi-commercial or pilot-plant scale in a few instances. This and experimental work with both gluing and the bolted-connector type give no basis for cost comparisons. Either will be considerably higher than a solid member of the same size, and only the results of experiments will tell whether the increased cost is justified.

Used 40 Years Ago

Glued, laminated members were first used in Europe, particularly in Germany, Sweden and Switzerland, nearly 40 years ago. Therefore, they cannot be called an untried form of construction. Their use by railroads, however, is recent and not yet widespread. With the rapid depletion of good timber of sufficient size for our railroad caps and stringers the use of laminated timbers will be accelerated. The scarcity of steel for construction imposed by the rearmament program has greatly accelerated the use of laminated members which are taking the place of steel at places heretofore thought impossible. The War Production Board estimated that in one war year 800 million feet of lumber were saved by timber-connector construction alone.

It seems certain that laminated timbers will play an increasingly important role in the future.

This report is intended to be a brief account of work in this field and is not intended in any way as a specification. The committee is indebted to the Forest Products Laboratories of the United States and Can-

ada, the Southern Pine Inspection Bureau, and a number of manufacturers for information used in making this report.

DISCUSSION

C. A. Moser (Sac. Nor.) stated that he would be interested in inspecting the installations of laminated timbers if there were any test locations not too far from his headquarters at Sacramento. Chairman Benson advised that the one nearest to Sacramento would be at Durnid, Calif., on the Los Angeles division of the Southern Pacific. In response to a question by T. M. Von Sprecken (Sou.) as to the greater cost of laminated timbers as compared with solid timbers, Chairman Benson said it would be approximately 60 per cent more. W. R. Roof (C.G.W., retired) raised the question as to whether the glued laminated timbers were treated in any way, to which Chairman Benson replied that they were not.

Effects of the 40-Hr. Week on Bridge and Building Maintenance

Report of Committee

COMMITTEE—F. W. HUTCHESON, *Chairman,* supvr. b. & b., C.& O., Newport News, Va.; I. A. MOORE, *Vice-Chairman,* ch. engr., C.& E.I., Danville, Ill.; A. HAMILL, *Vice-Chairman,* b. & b. mast., Esquimalt & Nanimo, Victor, B. C.; GEO. S. CRITES, retd. div. engr., B.& O., Baltimore, Md.; LEO D. GARIS, gen. br. insp., C.& N.W., Chicago; R. R. GUNDERSON, asst. br. engr., Sou., Washington, D. C.; H. M. HARLOW, asst. gen. supvr. b. & b., C.& O., Richmond, Va.; J. E. HECK, supvr. b. & b. C.& O., Ashland, Ky.; LEE MAYFIELD, res. engr., M. P., Houston, Tex.; A. W. SHROEDER, ch. engr., C.& E.I., Danville, Ill.; O. W. STEPHENS, asst. to ch. engr. mtce., D.& H., Albany, N. Y.; A. L. STEWART, JR., asst. supvr., Sou., Selma, Ala.; ARTHUR B. WANG, res. engr., C.I.& L., Lafayette, Ind.; J. F. WARRENFELLS, JR., mast. carp., S. A. L., Savannah, Ga.; and G. R. WEBBER, ch. carp., C.M.St.P.& P., Spokane, Wash.

The advent of the 40-hr. basic work week for non-operating railroad employees, which became effective September 1, 1949, was viewed with grave concern by management and supervisory personnel of the American railroads. There was cause for this concern, as no other event since the adoption of the basic 8-hr. work day in 1918, has so vitally affected the maintenance and operation of the railroads. This new agreement reflected a direct loss of 17 per cent in man-hours worked, with no loss in take-home pay for the employees involved.

Since this report will deal only with the effects of the 40-hr. week on bridge and building maintenance, all further statements and references shall be to that effect. Obviously, the report must be of a general nature as these working conditions have been in existence for only two years. For this reason we cannot be too specific in our statements but shall deal rather with those trends and conditions that have developed up to the present time.

Deferred Work Accumulates

The maintenance programs of some railroads were in arrears prior to September 1949, not having fully recovered from the effects of the labor and material shortage during World War II. The additional loss in man-hours has further aggravated this condition to the extent that in some cases it is a serious problem. This is particularly true with reference to steel and masonry repairs and also painting in general. Material shortages may further complicate our repair programs.

Investigation by questionnaire has brought out that, without exception on the railroads reporting, there was no increase in the num-

ber of employees to offset the reduction in man-hours occasioned by the inauguration of the 40-hr. week. In many instances there was an actual reduction in the number of employees to help offset the increase in labor cost. The position of our managements in this respect is readily understood upon an examination of the records throughout the past decade, which shows a continual increase in labor costs, not fully compensated for by increased earnings.

To those of us interested in properly maintaining our territories, these facts are not pleasant, but nevertheless they are real and must be confronted as such. It is again a real challenge to those men on our railroads who have before been confronted with obstacles of varying degree but who have in turn met them with real courage and resourcefulness.

There are a few developments which have contributed towards tempering the shock resulting from these lost man-hours. These developments have occurred on the majority of the railroads that responded to a questionnaire sent out for that purpose. The committee believes that the replies to the questionnaire provide a fair cross-sectional view of the situation on the American railroads with respect to this subject.

Increased Mechanization

The general trend through the past several years has been towards greater mechanization of our bridge and building forces in order to counteract, in some measure, the steadily increasing cost of both labor and materials. This program has been definitely accelerated during 1950 and thus far in 1951, particularly with reference to certain items.

Greater use is now being made of trucks for transporting B.& B. gangs. The increased efficiency resulting from the use of trucks instead of motor cars for transporting men from headquarters to outlying points or from camp cars to jobs on line of road, is conservatively estimated to be from 15 to 18 per cent. Truck transportation provides more on-the-job hours, and is also considered an advantage from the safety standpoint. We realize there are some territories which will not permit the use of motor-truck equipment, but these make up only a very small percentage of the over-all picture.

It is noted that during the past two years, the purchase of timber saws, impact and power wrenches, and several other items of small tools, has definitely been on the increase. The use of power tools has not yet reached the point of greatest efficiency and we feel that herein lies a fertile field for further study and action. We cannot approach the maximum efficiency of labor until such time as the gangs are fully mechanized. Such a course may be retarded to some extent by the shortage of strategic materials.

It is very important that all tools and equipment be kept in the best possible state of repair. A bridge and building gang may have any number of tools in its tool car but if these tools are not available for use when needed, they are of no value. Most roads have traveling mechanics, in addition to a centralized repair shop, who very often can make the needed repairs and get these tools back in operation without too much lost service time. The supervisor should impress upon each of his foremen the necessity of promptly reporting all breakdowns of all tools and equipment.

Closer Supervision

One result of the 40-hr. week was the necessity for more frequent and closer supervision of the bridge and building gangs. Since there was no additional allowance to make up for the loss in man-hours it is necessary to obtain more efficient use of the employees' working time. It is also necessary for the supervisor to follow closely the delivery of materials and the movement of the gangs from one point of work to another to minimize delays. All this, of course, requires more frequent and probably longer visits to the job sites by the supervisor.

Many railroads have supplied their supervisors with automobiles, station wagons or pick-up trucks of ½ or ¾ ton capacity for use in covering their territories. The use of trucks is most desirable because it is possible also to take along needed tools or materials from terminal headquarters and to return broken-down tools in need of repairs. Some roads allow their supervisors a mileage rate on the use of their personal automobiles.

General practice on many railroads, prior to the 40-hr. week, was to allow B.& B. gangs to make up time for week-end trips home. This was accomplished in various ways. Some were allowed to work five 10-hr. days and thus go to their homes on Friday night. Others worked 8 hr. on Monday,

9 hr. Tuesday through Friday, and 4 hr. on Saturday. While this practice was a distinct advantage to the employees, it did penalize the railroads in lost efficiency. The 10-hr. day was not good because of the longer hours of being on duty and also because of insufficient daylight to work efficiently and safely during the winter season. The 4-hr. day on Saturday was not good because the ratio of preparation and travel time was entirely too high for the number of on-the-job hours.

Make-up Time Eliminated

Under the 40-hr. week, make-up time has been nearly eliminated. The general work week is Monday through Friday, but in a few instances it is Tuesday through Saturday. There are, of course, occasional cases throughout the country which still require a small amount of makeup time in order for the employees to meet train schedules to and from the job site on week ends. However, we can definitely report that make-up time is being held to a minimum consistent with transportation problems.

Many roads have reported that morale is much better among the men due to the longer week end at home. This improvement in morale is reflected in more efficient work during the 40 hr. they are on the job. Some roads also report that there is definitely less absenteeism now than before the 40-hr. week; others can see no difference in this respect.

Much thoughtful consideration has been given to the use of more durable materials, and it is evident that the 40-hr. week has accelerated such programs. Some roads have already adopted, and partially carried out, various phases of replacement programs using materials of a more durable type. Other roads are now making further studies along this line. We believe this field presents great possibilities as the labor cost for applying materials of a durable type is very little higher than for those of a temporary type.

It is not the purpose of this report to go into a detailed discussion of these possibilities, but we desire to mention briefly a few of the more important phases relating to the subject.

Considerable stress has been placed on the use of treated timber for B.& B. work during the past several decades. In view of the results obtained from the use of various preservatives, better seasoning conditions, better specifications and closer inspection, we believe there is still room for more emphasis in respect to this matter. The advantages of treated timber in lengthening the maintenance cycle have been proved. Therefore, greater use of these materials will further lengthen this cycle. Over a longer period this will eventually offset a portion of the man-hours lost due to the 40-hr. week.

Use Prefabricated Buildings

Some roads are giving preference to the use of pre-fabricated steel buildings as replacements of small roadway and terminal buildings of wood. The first cost is somewhat greater, but this cost is more than compensated for in the savings in maintenance through the years following construction. Several other roads indicate that they are giving considerable study to this subject, but the scarcity of steel has reduced the availability of material for this type of construction. At the present time no one is able to predict how long this condition may exist.

A continued effort should be made to eliminate bridges and trestles by the use of pipes and culverts where possible. Some of our western roads report savings in the replacement of open-deck timber trestles with ballasted-deck trestles of either treated timber or concrete decks. Others are using concrete piling in lieu of treated timber piling. The longer life expectancy of concrete-pile structures offsets the higher initial cost.

There has been a noticeable trend toward the use of masonry in new construction and also in certain replacements of wooden buildings during the past few years. This applies to both terminal buildings and those along line of road. Use of aluminum or other durable roofs materially reduces maintenance for many years.

These are only a few of the more important phases of bridge and building construction and maintenance whereby savings can be effected by the use of more permanent materials in order to reduce maintenance costs. In view of what has been done, we believe much more can be accomplished along this line by careful study and planning.

Conclusions

It is evident that maintenance budgets will not provide additional allowances to offset the loss in man-hours occasioned by the advent of the 40-hr. basic work week. There

is no indication that any increase can be expected in the immediate future.

In view of this situation there can be but one conclusion. We must do the job with what we have, but in order to do that it must be done more efficiently now than before the 40-hr. week. The committee believes this can be accomplished by giving increased emphasis to the following suggestions:

(1) Increased mechanization of bridge and building gangs with respect to small tools, equipment and transportation facilities. The goal should be set at 100 per cent. In advancing such a program we must not overlook the importance of properly maintaining these tools and equipment so that they are available for use.

(2) Closer supervision of bridge and building gangs to minimize lost time in movements from one project to another, to have the material available for use when needed, and to see that proper use is being made of all types of tools and equipment.

(3) Make further use of more durable materials in both construction and replacements of buildings and structures in order to increase the maintenance cycle.

(4) Exert all influences possible to improve the morale of the employees to obtain more efficient production.

(5) Cooperate with the tool and equipment industry in order that they will continue to build better and more efficient tools and equipment.

DISCUSSION

In reply to a question by Chairman Hutcheson as to whether the 40-hr. week has resulted in excessive overtime work on the part of bridge and building crews, E. H. Barnhart (B.& O.) said that on his division the men are not worked overtime at all except in cases of emergency. Next, L. D. Garis (C.& N.W.) said that, because of the reduction in man-hours occasioned by the inauguration of the 40-hr. week, deferred maintenance was becoming a serious problem, and to overcome it pressure should be put on managements to increase forces when necessary. G. S. Crites (B.& O., retired) stated, however, that he believed the problem would have to be solved by planning, scheduling the work properly, and the application of ingenuity rather than by increasing the payroll. Discussing the problem of deferred maintenance further, Chairman Hutcheson mentioned that, in special cases, management will usually provide additional allowances.

J. M. Gustafson (M.& St.L.), discussing the possibilities of more durable construction to offset the reduction in man-hours resulting from the 40-hr. week, said that in many instances timber bridges could be replaced by culverts. Mr. Crites, however, urged caution in this practice because the reduction in waterway areas might be too great, with the result that washouts might occur in times of exceptional rainfalls.

Fire Protection of Bridges, Trestles and Culverts

Report of Committee

COMMITTEE—T. E. JACKSON, *Chairman,* gen. b. & b. supvr., S.P., San Francisco, Calif.; W. H. PRYOR, *Vice-Chairman,* gen. fore. b. & b. and w.s., St.L-S.F., Memphis, Tenn.; C. V. LUND, *Vice-Chairman,* asst. engr., C.M.St.P.& P., Chicago; M. H. DICK, editor, Ry. Engr. & Mtce., Chicago; L. T. ERICSON, ch. engr., The Jennison Wright Corp., Toledo Ohio; PETE FIELD, sls. repr., Detroit Graphite Co., St. Louis, Mo.; A. R. HARRIS, engr. of br., C.& N.W., Chicago; N. D. HOWARD, sec., Amer. Ry. Engr. Asso., Chicago; V. W. HUTCHINGS, b. & b. supvr., S. P., Bakersfield, Calif.; R. S. KIESTER, sls. repr., Pacific Coast Borax Co., Houston, Tex.; L. R. MORGAN, fire prev. engr., N.Y.C., Detroit, Mich.; D. B. MABRY, mgr. lbr sls., T. J. Moss Tie Co., St. Louis, Mo.; C. J. SHAPLAND, asst. engr. b. & b., C.V., St. Albans, Vt.; H. A. SPRENGEL, asst. b. & b. supvr., M. P., Falls City, Neb.; R. A. VAN NESS, br. engr. sys., A.T.& S.F., Chicago; and F. T. WINTERS, JR., mgr.-weed contr. div., Pacific Coast Borax Co., Los Angeles, Calif.

Notwithstanding the progress that has been made in the use of fire-retardant materials and in the various methods devised to protect wood structures from fire, the annual loss and damage to structures on American railroads due to fires from various causes is still a serious matter.

The Association of American Railroads, Fire Protection and Insurance Section, reports that 287 fires occurred in bridges, trestles and culverts during the year 1949, with losses amounting to $595,419. Of this amount 21.4 per cent is classified as caused by locomotives or equipment, 22.9 per cent as resulting from exposure to outside fires, 32.8 per cent from various other sources, and 22.9 per cent from unknown causes. A substantial proportion of this total loss could unquestionably have been eliminated through the increased use of accepted fire-preventive measures in the construction and maintenance of structures. The annual loss would be many times larger were it not for the present widespread use of the various means available for preventing fires. In the previous year the A.A.R. reported 273 fires, with a loss of $883,354.

Seek Better Methods

Maintenance officers of all railroads are seeking new and better methods of combatting and controlling fire in railroad structures to reduce the costly delays to traffic, loss of property, and the possibilities of personal injuries or loss of life.

In order to secure maximum service lift, it is the practice on nearly all railroads to treat timber and piling with creosote oil. While creosote-treated timber does present a fire hazard, economic considerations are the predominant factor favoring its use. In this regard a report of a cooperative committee made the following statement in regard to fire prevention many years ago, which remains true today:

"Creosoted material appears to be somewhat more difficult to ignite than untreated material, but once ignited it creates a fire which is hotter and more difficult to control and which is known by experience to be more destructive than fire in untreated material. However, decayed or partially decayed untreated wood is very easily ignited and has caused many fires.

"The likelihood of fire is increased by treatment which results in excessive bleeding of oil, such as might be caused by heavy treatment of green lumber. It should be noted that freshly creosoted material is much more inflammable than that in which the treatment is several months old.

Order Material Early

It is urgently recommended that orders for creosoted material be placed as far in advance as possible so the material may season for from three to six months in advance of the construction.

Where it is practicable to do so, freshly treated timber may be rendered more fire resistant by thoroughly coating the upper surface with sand or dry cement. The application should be continued as long as there is any bleeding of oil."

The effort made by railroads in fire protection of open-deck structures is reflected in the following review of various methods that have been adopted, some of which found only scattered favor, and others which found widespread acceptance and continued use.

The earlier means of fire protection were the water barrel and sand box, with necessary pails or shovels, placed at the ends of structures, and at specified intervals on the longer structures. A later practice consisted of providing a solid deck by inserting fillers between the ties, and applying a crushed rock or gravel fire-protective covering. This method was not found satisfactory because the deck timber could not be readily inspected, decay in the then untreated timber was greatly accelerated, and the rock covering would not remain in place.

Metal Sheets Used

Galvanized sheet-metal covering placed over the entire top surface of bridge decks came into use. This plan likewise made inspection difficult, and also caused trouble with the circuits in signal territory. Recently, aluminum sheet covering has been used on at least one important bridge.

Another standard called for 1-in. treated flooring nailed over treated ties, and a covering of about 2 in. of ballast. This type protection was not satisfactory because of shifting of the ballast. A modification of this plan provided for covering the flooring with asbestos felt, chicken mesh, hot asphalt, and pea gravel; the covering extended over onto the rail flange. This construction gave satisfactory protection, but in time creeping of the rail resulted in the tearing of the covering and in itself became a fire hazard; walkways similarly protected gave satisfactory service. This construction was later revised to separate the rail from the covering by laying strips of sheet metal up over the edge of the rail. This was successful as long as the rail and joints did not creep.

Galvanized sheet metal, placed over the tops of caps and over the tops of stringer chords, was adopted by some railroads at an early date, and this practice remains in favor on many railroads. It is probably the most widely used of all methods for protecting these portions of trestles.

The application of oil paints, mixed with Portland cement and sand, to the tops of ties and stringers is a practice of many years standing.

The use of timber pressure-impregnated with various water-soluble salts having fire-retardant properties has had limited use in bridge structures. In hot, dry locations, timber treated with these salts tends to become brittle, and to check severely, thus increasing the fire hazard. In wet locations, relatively rapid leaching of the salts occurs, reducing or eliminating the protection.

Fire Detection Systems

Some installations of fire detection systems have been made to long and important bridges. These consist essentially of insulated wire with fusible links laid across the structure in the most advantageous manner, connected to the signal circuit. In case of fire, the fusible inks burn out and cause the signals to be placed at "stop," and may also be wired to give an indication or alarm to the dispatcher. One modification made of this type of protection for very important bridges provides a water supply and drypipe water line laid on the deck of the structure, with necessary piping to sprinkler heads, in addition to the fusible-link detection system. The dispatcher, on receipt of an indication, may turn on the water by remote control, or it may be made automatic.

The most recent method of protecting open-deck bridges and trestles against deck-fires consists of applying bituminous coatings over the tops of the ties, stringers, guardrail and walk plank, and into which pea gravel is embedded. The results have been very encouraging thus far in those territories where it has been extensively used. A detailed description of this method is contained in a previous report to this Association and printed in the 1949 Proceedings.

Foot walks of steel checkered plates and steel handrails offer substantially complete protection on large open-deck bridges and reduce the inflammable material on structures of this class.

Fire Breaks Are Good

The use of fire breaks in the longer timber trestles has been accepted as good practice for many years. These may be constructed of concrete masonry, or by sheathing pile or timber bents with cement-asbestos board, or other non-combustible or slow-burning construction.

One railroad is planning to encase, to necessary height, the individual piles in some

bents of certain important trestles with a covering of mesh-reinforced concrete, as protection against ground fires, and is also considering the use of asbestos-cement board applied to the exposed portions of the caps at end bents, to bulkhead timbers, and to the undersides of stringers in the end spans, because of the prevalence of fires at or near the ends of structures.

With regard to timber culverts, greatest emphasis is placed on keeping such structures free from combustible material, and keeping vegetation and brush cut at the ends of the culverts. Timber culverts on most railroads have been gradually replaced by concrete or corrugated metal pipe.

Ballast-Deck Structures

Ballast-deck structures offer substantially complete protection against fires which originate on the deck, and it is also current practice on some railroads to cover the ballast-retaining timber with galvanized iron. The use of fire breaks in long ballast-deck trestles is about as common as in open-deck structures.

As with open-deck trestles, the extreme importance of keeping the area around and under structures cleared of brush and vegetation growths, debris and drift, needs continued emphasis. The use of chemicals to sterilize the ground and prevent weed growth is currently receiving much attention and their use for this purpose is rapidly increasing.

Making Wood Fire Retardant

The present state of progress in protecting wood structures against loss by fire is reviewed in an authoritative paper by the Forest Products Laboratory of the U.S. Department of Agriculture entitled "Making Wood Fire Retardant," published in March, 1950. The following is extracted from that publication:

"In discussing fire-retardant treatments for wood it should be kept in mind that there are two distinct aspects of fire performance. One is fire spread, and relates to the rapidity or freedom with which fire spreads over a surface that has been ignited. The other may be termed fire resistance and relates to the tendency of fire to penetrate a member or structure. The manner and extent to which the spread of fire is retarded and in which penetration of fire is resisted are often closely related.

"Wood chars when exposed to fire or fire temperatures, irrespective of whether it has had a fire-retardant treatment or application. The rate of charring or destruction and the transmission of heat through wood may be improved slightly by fire-retardant treatments but the most significant benefit comes in reducing or delaying the spread of fire. Fire-retardant treatments and applications can only be expected to retard the burning and spread of fire to the point where the wood will not continue to burn when the ignition source is removed or exhausted.

"Two general methods are available for improving the performance of wood under fire conditions. One method consists of an impregnation treatment that deposits chemicals within the wood. The other is the application of coatings or layers of other non-combustible materials over the surface of the wood.

"Many water-soluble chemicals exhibit fire-retarding properties when present in wood but because of cost limitations or various objectionable characteristics, comparatively few are considered practical. Among the most commonly used chemicals are monobasic and dibasic ammonium phosphates, ammonium sulphate, borax, boric acid and zinc chloride. These are usually combined in various proportions in wood-treating formulas.

"Since the fire-retardant chemicals are water soluble and hence more or less leachable, the usefulness of treated material under exterior exposure and periodically wet conditions has not been well established.

"Many coating materials provide fire-retarding effects in varying degree to wood. As in the case of impregnation treatments the degree of protection provided by coatings is related to the inherent properties of the product, the amount and thoroughness of application, and the severity of the fire exposure."

Conclusions

The committee is of the opinion that the following practices, most of which are well established, hold the greatest promise of reducing fire losses:

(1) Ballast-deck construction should be used in preference to open-deck, where experience in the particular locality indicates the hazard from hot cinders, burning oil, hot brake shoe metal, fusees, etc., is serious.

(2) Timber trestles of considerable length should have fire breaks at intervals, constructed of concrete masonry piers or bents, cement-asbestos board sheathing applied to the pile bents, or other non-inflammable construction. Such barriers should be continued up between the stringers and ties.

(3) Timber used in bridge and trestle construction, when treated with creosote, should preferably be stored for several months before installation, to minimize the fire hazard of freshly creosoted timber.

(4) In those territories where deck fires are frequently experienced, careful consideration should be given to covering the vulnerable surfaces of ties, stringers, guard timbers and walk plank of open-deck bridges and trestles with coatings which have demonstrated their effectiveness and durability under the climatic conditions to which they are subjected in service.

(5) The use of sheet-metal coverings over the tops of caps and stringers is a time-tested and proven practice on many railroads, and merits continued use.

(6) Particularly important bridges may warrant the use of special fire-protection installations, such as fusible-link fire-alarm systems and dry-pipe sprinkler system. Also, the use of checkered plate foot-walk materials and steel handrails should be considered on large bridges in the interest of reducing the amount of inflammable material construction.

(7) Increased consideration should be given to providing fire-extinguishers at important structures.

(8) The actual availability and effectiveness of water or sand from water barrels or sand boxes should be given greater consideration in evaluating comparative merits of these long-established practices as compared to other methods of fire protection.

(9) Such well-established and extremely important practices as the removal of drift and debris from under structures, the removal of punk wood, refuse, etc., and the clearing of vegetation from under and around structures are essential to fire prevention.

(10) The effectiveness of chemicals, to sterilize the soil and retard or prevent the growth of vegetation has already been demonstrated, and its economy in many territories as compared to hand scalping or cutting of weeds and brush has been established. Increased attention should be given this method.

DISCUSSION

In the committee chairman's absence, Vice-chairman W. H. Pryor (St.L-S.F.) read the report. The discussion was begun by J. J. Healy (B.&M.) who referred to that portion of the report dealing with coating the bridge decks with a bituminous material and gravel, and stated that he had difficulty in applying this coating to the sides of the bridge ties. He tried building a form for this purpose which slowed down the work and made it an expensive undertaking. Hence, he doubted the economy of carrying the coating down the sides of the ties.

Lee Mayfield (M.P.) stated that he had carried this work out on three bridges, one 800 ft., another 1,000 ft. and the third 1,500 ft. long, and that he had coated the sides of the ties by holding short boards at the sides while the bituminous material and pea gravel were being applied. The cost for this work, using a small hand pump for the bituminous application, ran around $.80 a sq. ft., he said, and after three years of service, the coatings are still in good condition.

F. M. Misch (S.P.) said that his road has used this same process on about 80 miles of timber bridge decks with good results, but the coating, except what might spill over, is confined to the top surface of ties, stringers and guard timbers. He added that they use small, easily-installed-and-removed forms for holding the gravel in place overnight, by which time the coating is well set. Mr. Mayfield said that the surface on which the coatings are applied must be absolutely dry at the time of application, and that failure to obtain a good bond can often be attributed to applying the coating after a rain or even during foggy weather.

G. S. Crites (B.&O., retired) stated that he had noted some instances on eastern railroads where cinders were placed on the ground around piles and also used as backfill at bulkheads. He warned that ground fires will sometimes ignite cinders and, when used around bridges, can cause long-smoldering fires that would endanger the structures.

Kills Weeds Under Bridges

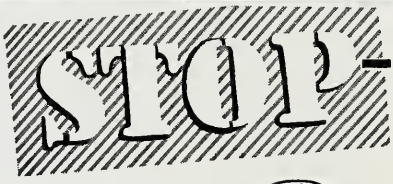
To a question raised by E. L. Collette (St.L-S.F.) as to a comparison of the hazard of fires instigated through the operation of diesel and steam locomotives, Vice-Chairman

Pryor replied that he had no such figures, but that he knew that fires starting from dropped hot cinders were far less in number than those originating from chips off of hot brake shoes. He added that replies from committee members indicated that fire-protection methods for bridges and trestles were the same over the country. His road, he continued, used chemicals to destroy weeds under bridges which was far cheaper than hand scalping with the present labor rates. In addition, the chemicals have the advantage of killing the weeds for at least one year, whereas hand scalping had to be repeated in a few weeks after the first operation.

Mr. Crites said that he took exception to the general belief that large numbers of fires are started by hot cinders dropped by steam locomotives, and that he likewise believed that few fires started from pieces of hot brake shoes. To this J. F. Warrenfells (S.A.L.) stated that he had seven fires originating from pieces of hot metal dropping from brake shoes on old cypress bridges ties.

L. B. Mohney (Pitts & Shaw.) asked why one of the more recently introduced tie protective coatings did not require a gravel sprinkling. Several members present stated that they had made use of the newer coating without gravel but that the applications had been made only from three weeks to two months ago and that it was still too soon to draw any conclusions. In this connection, L. R. Morgan (N.Y.C.) said that the Fire Protection & Insurance Section of the A.A.R. is preparing a report on the comparative values of various coatings and that this report should be available in a few months.

Vice-Chairman Pryor referred to the insulated wire with fusible links mentioned in the committee report and stated that the signal men on his road were opposed to their use because of fuse failure would sometimes effect the operation of the signals. But H. R. Demmon (S.P.) said that the links are used on his road and he cannot recall of a single instance where any failure of the links caused the signals to show Stop indications unnecessarily. Mr. Misch said that he did know of a few instances where vibration caused a few of the links to break, resulting in some unnecessary stop signal indications. On the other hand, he added, the links have called attention to fires which, if they had gotten out of control, would have caused far more serious damage than a few unnecessary stops of trains.



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Secretary	S. F. Patterson	S. F. Patterson	S. P. Patterson	S. F. Patterson
Treasurer	C. P. Austin	C. P. Austin	C. P. Austin	C. P. Austin
Executive Members	R. H. Reid	W. O. Eggleston	H. Rettinghouse	W. O. Eggleston
	W. O. Eggleston	A. E. Killam	A. E. Killam	A. E. Killam
	A. E. Killam	H. Rettinghouse	J. S. Lemond	J. S. Lemond
	R. C. Sattley	J. S. Lemond	C. W. Richey	C. W. Richey
	H. Rettinghouse	W. H. Finley	H. H. Eggleston	H. H. Eggleston
	J. S. Lemond	C. W. Richey	F. E. Schall	B. J. Sweatt

	1907-1908	1908-1909	1909-1910	1910-1911
President	R. H. Reid	J. P. Canty	H. Rettinghouse	H. Rettinghouse
1st V.-Pres.	J. P. Canty	H. Rettinghouse	J. S. Lemond	F. E. Schall
2nd V.-Pres.	H. Rettinghouse	F. E. Schall	F. E. Schall	A. E. Killam
3rd V.-Pres.	F. E. Schall	J. S. Lemond	A. E. Killam	J. N. Penwell
4th V.-Pres.	W. O. Eggleston	A. E. Killam	J. N. Penwell	L. D. Hadwen
Secretary	S. F. Patterson	S. F. Patterson	C. A. Lichty	C. A. Lichty
Treasurer	C. P. Austin	C. P. Austiin	J. P. Canty	J. P. Canty
Executive Members	A. E. Killam	J. N. Penwell	W. Beahan	T. J. Fullem
	J. S. Lemond	Willard Beahan	F. B. Scheetz	G. Aldrich
	C. W. Richey	F. B. Scheetz	L. D. Hadwen	P. Swenson
	T. S. Leake	W. H. Finley	T. J. Fullem	G. W. Rear
	W. H. Finley	L. D. Hadwen	G. Aldrich	W. O. Eggleston
	J. N. Penwell	T. J. Fullem	P. Swenson	W. F. Steffens

	1911-1912	1912-1913	1913-1914	1914-1915
President	F. E. Schall	A. E. Killam	J. N. Penwell	L. D. Hadwen
1st V.-Pres.	A. E. Killam	J. N. Penwell	L. D. Hadwen	G. Aldrich
2nd V.-Pres.	J. N. Penwell	L. D. Hadwen	G. Aldriich	G. W. Rear
3rd V.-Pres.	L. D. Hadwen	T. J. Fullem	G. W. Rear	C. E. Smith
4th V.-Pres.	T. J. Fullem	G. Aldrich	C. E. Smith	E. B. Ashby
Secretary	C. A. Lichty	C. A. Lichty	C. A. Lichty	C. A. Lichty
Treasurer	J. P. Canty	J. P. Canty	J. P. Canty	F. E. Weise
Executive Members	G. Aldrich	G. W. Rear	W. F. Steffens	W. F. Steffens
	P. Swenson	W. F. Steffens	E. B. Ashby	S. C. Tanner
	G. W. Rear	E. B. Ashby	S. C. Tanner	Lee Jutton
	W. F. Steffens	C. E. Smith	Lee Jutton	W. F. Strouse
	E. B. Ashby	S. C. Tanner	W. F. Strouse	C. R. Knowles
	W. O. Eggleston	Lee Jutton	C. R. Knowles	A. Ridgway

	1915-1916	1916-1917	1917-1918	1918-1919
President	G. W. Rear	C. E. Smith	S. C. Tanner	Lee Jutton
1st V.-Pres.	C. E. Smith	E. B. Ashby	Lee Jutton	F. E. Weise
2nd V.-Pres.	E. B. Ashby	S. C. Tanner	F. E. Weise	W. F. Strouse
3rd V.-Pres.	S. C. Tanner	Lee Jutton	W. F. Strouse	C. R. Knowles
4th V.-Pres.	Lee Jutton	F. E. Weise	C. R. Knowles	A. Ridgway
Sec.-Treas.	C. A. Lichty	C. A. Lichty	C. A. Lichty	C. A. Lichty
Executive Members	F. E. Weise	W. F. Strouse	A. Ridgway	J. S. Robinson
	W. F. Strouse	C. R. Knowles	J. S. Robinson	J. P. Wood
	C. R. Knowles	A. Ridgway	J. P. Wood	A. B. McVay
	A. Ridgway	J. S. Robinson	D. C. Zook	J. H. Johnston
	J. S. Robinson	J. P. Wood	A. B. McVay	E. T. Howson
	J. P. Wood	D. C. Zook	J. H. Johnston	C. W. Wright

	1919-1920	1920-1921	1921-1922	1922-1923
President	F. E. Weise	W. F. Strouse	C. R. Knowles	Arthur Ridgway
1st V.-Pres.	W. F. Strouse	C. R. Knowles	A. Ridway	J. P. Wood
2nd V.-Pres.	C. R. Knowles	A. Ridgway	J. S. Robinson	J. S. Robinson
3rd V.-Pres.	A. Ridgway	J. S. Robinson	J. P. Wood	C. W. Wright
4th V.-Pres.	J. S. Robinson	J. P. Wood	C. W. Wright	E. T. Howson
Sec.-Treas.	C. A. Lichty	C. A. Lichty	C. A. Lichty	C. A. Lichty
Asst. Sec.			F. E. Weise	F. E. Weise
Directors	J. P. Wood	C. W. Wright	E. T. Howson	F. C. Baluss
	A. B. McVay	A. B. McVay	J. H. Johnston	Maro Johnson
	J. H. Johnston	G. A. Manthey	E. K. Barrett	O. F. Dalstrom
	E. T. Howson	E. T. Howson	F. C. Baluss	S. D. Corey
	C. W. Wright	J. H. Johnston	Maro Johnson	W. B. Hotson
	G. A. Manthey	E. K. Barrett	O. F. Dalstrom	P. N. Nelson

	1923-1924	1924-1925	1925-1926	1926-1927
President	J. S. Robinson	J. P. Wood	C. W. Wright	E. T. Howson
1st V.-Pres.	J. P. Wood	C. W. Wright	E. T. Howson	F. C. Baluss
2nd V.-Pres.	C. W. Wright	E. T. Howson	F. C. Baluss	Maro Johnson
3rd V.-Pres.	E. T. Howson	F. C. Baluss	Maro Johnson	J. S. Huntoon
4th V.-Pres.	F. C. Baluss	Maro Johnson	J. S. Huntoon	C. S. Heritage
Sec.-Treas.	C. A. Lichty	C. A. Lichty	C. A. Lichty	C. A. Lichty
Asst. Sec.	F. E. Weise	F. E. Weise	F. E. Weise	F. E. Weise
Directors	S. T. Corey	J. S. Huntoon	C. S. Heritage	A. I. Gauthier
	W. B. Hotson	A. I. Gauthier	W. B. Hotson	E. L. Sinclair
	P. N. Nelson	E. L. Sinclair	P. N. Nelson	O. F. Dalstrom
	J. S. Huntoon	C. S. Heritage	A. I. Gauthier	W. T. Krausch
	A. I. Gauthier	W. B. Hotson	E. L. Sinclair	R. C. Bardwell
	E. L. Sinclair	P. N. Nelson	O. F. Dalstrom	H. I. Benjamin

	1927-1928	1928-1929	1929-1930	1930-1934
President	F. C. Baluss	Maro Johnson	J. S. Huntoon	C. S. Heritage
1st V.-Pres.	Maro Johnson	J. S. Huntoon	C. S. Heritage	A. I. Gauthier
2nd V.-Pres.	J. S. Huntoon	C. S. Heritage	A. I. Gauthier	H. I. Benjamin
3rd V.-Pres.	C. S. Heritage	A. I. Gauthier	H. I. Benjamin	W. T. Krausch
4th V.-Pres.	A. I. Gauthier	H. I. Benjamin	W. T. Krausch	T. H. Strate
Sec.-Treas.	C. A. Lichty	C. A. Lichty	C. A. Lichty	C. A. Lichty
Asst. Sec.	F. E. Weise	F. E. Weise		
Directors	W. T. Krausch	R. C. Henderson	G. A. Rodman	E. C. Neville
	R. C. Bardwell	J. S. Ekey	W. A. Batey	H. H. Best
	H. I. Benjamin	T. H. Strate	F. W. Hillman	J. E. King
	R. C. Henderson	G. A. Rodman	E. C. Neville	A. B. Scowden
	T. H. Strate	W. A. Batey	H. H. Best	W. A. Batey
	J. S. Ekey	F. W. Hillman	J. E. King	L. C. Smith

	1934-1935	1935-1936	1936-1937	1937-1938
President	H. I. Benjamin	T. H. Strate	E. C. Neville	C. M. Burpee
1st V.-Pres.	T. H. Strate	E. C. Neville	C. M. Burpee	F. H. Masters
2nd V.-Pres.	E. C. Neville	C. M. Burpee	F. H. Masters	W. S. Lacher
3rd V.-Pres.	A. B. Scowden	F. H. Masters	C. A. J. Richards	C. A. J. Richards
4th V.-Pres.	W. R. Roof	C. A. J. Richards	W. S. Lacher	F. H. Cramer
Sec.-Treas.	C. A. Lichty	C. A. Lichty	C. A. Lichty	C. A. Lichty
Directors	C. M. Burpee	A. L. McCloy	W. R. Roof	B. R. Meyers
	W. A. Batey	R. P. Luck	T. P. Soule	G. S. Crites
	L. C. Smith	H. H. Best	F. H. Cramer	R. E. Dove
	C. A. J. Richards	W. R. Roof	B. R. Meyers	T. P. Soule
	A. L. McCloy	T. P. Soule	G. S. Crites	A. Chinn
	R. P. Luck	F. H. Cramer	R. E. Dove	L. G. Byrd

	1938-1939	1939-1940	1940-1941	1941-1942
President	Armstrong Chinn	A. E. Bechtelheimer	H. M. Church	R. E. Dove
1st V.-Pres.	F. H. Cramer	F. H. Cramer	R. E. Dove	F. H. Soothill
2nd V.-Pres.	A. E. Bechtelheimer	H. M. Church	F. A. Soothill	G. S. Crites
3rd V.-Pres.	H. M. Church	R. E. Dove	G. S. Crites	A. M. Knowles
4th V.-Pres.	R. E. Dove	F. H. Soothill	A. M. Knowles	N. D. Howard
Sec.-Treasurer	C. A. Lichty	C. A. Lichty		
Secretary	.....	.....	F. O. Whiteman	A. G. Shaver
Treasurer	.....	.....	F. E. Weise	F. E. Weise
Directors	L. G. Byrd	B. R. Meyers	N. D. Howard	R. E. Caudle
	W. R. Ganser	W. Walkden	L. G. Byrd	I. A. Moore
	F. H. Soothill	A. S. Krefting	K. L. Miner	W. A. Sweet
	B. R. Meyers	A. M. Knowles	R. E. Caudle	J. L. Varker
	W. Walkden	L. G. Byrd	I. A. Moore	L. E. Peyser
	A. S. Krefting	K. L. Miner	W. A. Sweet	Martin Meyer

	1942-1943	1943-1944	1944-1945	1945-1946
President	G. S. Crites	J. L. Varker	J. L. Varker	N. D. Howard
1st V.-Pres.	R. E. Caudle	R. E. Caudle	R. E. Caudle	F. G. Campbell
2nd V.-Pres.	A. M. Knowles	N. D. Howard	N. D. Howard	J. S. Hancock
3rd V.-Pres.	N. D. Howard	F. G. Campbell	F. G. Campbell	E. H. Barnhart
4th V.-Pres.	J. L. Varker	J. S. Hancock	J. S. Hancock	W. F. Martens
Secretary	A. G. Shaver† Lorene Kindred† Elinor V. Heffern	Elinor V. Heffern	Elise LaChance	Elise LaChance
Treasurer	F. E. Weise	C. R. Knowles	C. R. Knowles	C. R. Knowles
Treasurer Emeritus		F. E. Weise	F. E. Weise	
Directors	M. Meyer	W. F. Martens	W. F. Martens	A. B. Chapman
	L. E. Peyser	A. L. McCloy	A. L. McCloy	W. A. Huckstep
	K. L. Miner	L. C. Winkelhaus	L. C. Winkelhaus	F. R. Spofford
	F. G. Campbell	E. H. Barnhart	E. H. Barnhart	Guy E. Martin
	J. S. Hancock	A. B. Chapman	A. B. Chapman	B. R. Meyers
	L. C. Winkelhaus	L. E. Peyser	L. E. Peyser	L. E. Peyser

†To November 1, 1942
†To February 1, 1943

	1946-1947	1947-1948	1948-1949	1949-1950
President	F. G. Campbell	J. S. Hancock	E. H. Barnhart	W. F. Martens
1st V.-Pres.	J. S. Hancock	E. H. Barnhart	W. F. Martens	W. A. Huckstep
2nd V.-Pres.	E. H. Barnhart	W. F. Martens	W. A. Huckstep	Guy E. Martin
3rd V.-Pres.	W. F. Martens	W. A. Huckstep	Guy E. Martin	F. R. Spofford
4th V.-Pres.	W. A. Huckstep	G. E. Martin	F. R. Spofford	Lee Mayfield
Secretary	Elise LaChance	Elise LaChance	Elise LaChance	Elise LaChance
Treasurer	C. R. Knowles	C. R. Knowles	L. C. Winkelhaus	L. C. Winkelhaus
Directors	Guy E. Martin	H. M. Harlow	Lee Mayfield	H. M. Harlow
	B. R. Meyers	H. B. Christianson	F. M. Misch	V. E. Engman
	L. E. Peyser	F. R. Spofford	W. D. Gibson	G. W. Benson
	H. M. Harlow	Lee Mayfield	H. M. Harlow	F. M. Misch
	H. B. Christianson	Franz M. Misch	V. E. Engman	L. R. Morgan
	F. R. Spofford	W. D. Gibson	G. W. Benson	J. A. Jorlett

	1950-1951
President	W. A. Huckstep
1st V.-Pres.	Guy E. Martin
2nd V.-Pres.	F. R. Spofford
3rd V.-Pres.	Lee Mayfield
4th V.-Pres.	H. M. Harlow
Secretary	Elise LaChance
Treasurer	L. C. Winkelhaus
Directors	F. M. Misch
	L. R. Morgan
	J. A. Jorlett
	M. H. Dick
	R. R. Gunderson
	J. F. Warrenfells

CONSTITUTION

ARTICLE I.

NAME

Section 1. This association shall be known as the American Railway Bridge & Building Association.

ARTICLE II.

OBJECT

Section 1.** The object of this association shall be the advancement of knowledge pertaining to the design, construction and maintenance of railway bridges, buildings, water service facilities, and other structures, by investigation, reports and discussions.

Section 2. The association shall neither indorse nor recommend any particular devices, trade marks or materials, nor will it be responsible for any opinions expressed in papers, reports or discussions unless the same have received the endorsement of the association in regular session.

ARTICLE III.

MEMBERSHIP

Section 1. The membership of this association shall be divided into five classes, viz: Members, life members, associate, honorary and junior members.*

Section 2.** A member shall be a person in a position above rank of gang foreman in connection with railway bridge, building and water service work. Any person desirous of becoming a member shall make application upon the form prescribed by the executive committee, setting forth his name, age, residence and practical experience. He shall furnish at least three references to whom he is personally known. Applicants may be voted into membership at any regular executive meeting or by letter ballot of the executive committee, a majority vote being necessary in either instance.

Section 3.** To be eligible for a life membership a member must have belonged to the association for at least twenty years and in general must have retired from active railway service due to age or physical disability. He shall have all the privileges of active membership, except the holding of office, and shall not be required to pay annual dues. The transfer from membership to life membership shall be made in the same manner as the election of members, as prescribed in Section 2, of this Article.

Section 4. Associates shall be responsible persons who are not eligible as members, whose pursuits or attainments qualify them to co-operate with members in the study and development of improved practices in the construction and maintenance of bridges, buildings and water facilities. They shall have all the rights of members except of voting and holding office. They shall be elected in the manner prescribed for members, in Section 2, of this Article.

Section 5. Honorary members shall be chosen from persons who have attained acknowledged eminence in some branch of engineering or railway service. Their number shall be limited to ten. Honorary members shall be proposed by not less than six active members and shall be elected by the unanimous vote of the members present at a regular meeting. They shall have all the rights of active members except that of holding office and shall be exempt from the payment of dues.

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*Amended October 16, 1941.
**Amended September 20, 1948.

Section 6. A junior member shall be a person who is a graduate of a recognized engineering school, or who has been employed for at least two years in the design, maintenance or construction of railway bridges, buildings or structures. Applicants shall be at least 21 years of age and they shall be elected in the manner prescribed for members, in Section 2 of this article. Juniors shall have all the rights of members except that of holding office. When the attainments of a Junior are such as to qualify him as a member, he may apply for promotion and the Executive Committee shall authorize such promotion when qualifications warrant the action. Unless a Junior is promoted, his membership shall cease automatically when he becomes 28 years of age.*

Section 7. Any member guilty of conduct unbecoming to a railroad officer and a member of this association, or who shall refuse to comply with the rules of this association, shall forfeit his membership on a two-thirds vote of the executive committee.

Section 8. Membership shall continue until written resignation is received by the secretary, unless member has been previously expelled, or dropped for nonpayment of dues in accordance with Section 1 of Article VII.

Section 9.** Only active members shall hold office in this association, and only active and life members shall be entitled to vote in the election of officers.

ARTICLE IV.

OFFICERS

Section 1. The officers of this association shall be a president, four vice-presidents, a secretary, a treasurer and six directors who with the most recent past president shall constitute the executive committee.

Section 2. The past presidents of this association, previous to the most recent past president, who continue to be members, shall be privileged to attend all meetings of the executive committee, of which meetings they shall receive due notice, and be permitted to discuss all questions and to aid said committee by their advice and counsel; but said past presidents shall not have a right to vote, unless called upon to fill a quorum.

Section 3. Vacancies in any office shall be filled for the unexpired term by the executive committee without delay.

ARTICLE V.

EXECUTIVE COMMITTEE

Section 1.** The executive committee shall manage the affairs of the association and shall have full power to control and regulate all matters not otherwise provided for in the constitution and by-laws and shall exercise general supervision over the financial interests of the association, and make all necessary purchases and contracts required to conduct the general business of the association but shall not have the power to render the association liable for any debt beyond the amount then in the treasury plus accounts receivable and not subject to other prior liabilities. All appropriations for special purposes must be acted upon at a regular meeting of the association.

Section 2. Meetings of the executive committee may be called by a majority of the members of the committee, providing 10 days' notice is given members by mail.

Section 3. Five members of the executive committee shall constitute a quorum for the transaction of business.

ARTICLE VI.

ELECTION OF OFFICERS AND TENURE OF OFFICE

Section 1. Except as otherwise provided the officers shall be elected at the regular annual meeting of the association and the election shall not be postponed except by unanimous consent of the members present at said annual meeting. The election shall be by ballot, a majority of the votes cast being required for election. Any active member of the association not in arrears for dues shall be eligible for office, but the president shall not be eligible for reëlection.

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*Amended October 16, 1941.

**Amended September 20, 1948.

BRIDGE MODERNIZATION AT CAIRO

• The year 1952 will see the completion of a new steel superstructure for the Illinois Central's 61-year old, main line bridge over the Ohio River at Cairo, Illinois.

American Bridge was the logical choice to perform the major construction feat of building the new 12-span superstructure on the original piers with a minimum of interruption in traffic.

The first span of the old 9-span bridge was rolled off its piers onto temporary falsework and new 518′, 1,700-ton span moved into position and opened to service after a traffic interruption of only 20 hours! Then the old span was launched like a ship into the river 100 ft. below for easy removal.

While this is the first time this procedure has been used on a job of such magnitude, it is a typical example of the part American Bridge is playing to help our vital railroad systems meet the needs of growing America.

INTERESTING FACTS

- 6 spans, 197′ 7″
- 4 spans, 400′ 11½″
- 2 spans, 518′ 11″
- Steel used, 10,000 tons.
- Erecting procedure: Illinois Central R.R. and American Bridge.
- Consulting Engineers: Modjeski and Masters.

AMERICAN BRIDGE DIVISION, UNITED STATES STEEL COMPANY,
GENERAL OFFICES: 525 WILLIAM PENN PLACE, PITTSBURGH, PA.

Contracting Offices in: AMBRIDGE · ATLANTA · BALTIMORE · BIRMINGHAM · BOSTON · CHICAGO CINCINNATI · CLEVELAND · DALLAS · DENVER · DETROIT · DULUTH · ELMIRA · GARY · MEMPHIS MINNEAPOLIS · NEW YORK · PHILADELPHIA · PITTSBURGH · PORTLAND, ORE. · ROANOKE ST. LOUIS · SAN FRANCISCO · TRENTON UNITED STATES STEEL EXPORT COMPANY, NEW YORK

AMERICAN BRIDGE

UNITED STATES STEEL

Section 2.† The president, four vice-presidents, secretary and treasurer shall hold office for one year and the directors for two years, three directors being elected each year. All officers retain their offices until their successors are elected and installed.

Section 3.†[1] The term of office of the secretary and the treasurer may be terminated at any time by a two-thirds vote of the executive committee. Their compensation shall be fixed by a majority vote of the executive committee.

The secretary shall also serve as secretary of the executive committee.

Section 4. The secretary and the treasurer shall be required to give bond in an amount to be fixed by the executive committee.

ARTICLE VII.

MEMBERSHIP FEE AND DUES

Section 1.† Every member upon joining this association shall pay to the secretary an entrance fee and dues as prescribed by the executive committee. No member in arrears for annual dues shall be entitled to vote at any election and any member more than one year in arrears may be stricken from the list of members at the discretion of the executive committee.

ARTICLE VIII.*

LOCAL SECTIONS

Section 1.** Upon the application of ten or more members of the association residing in the same geographical district, or having offices therein, the executive committee shall organize a local section for that district, to which all members in that district shall be eligible. Such local section shall admit to active membership only members in good standing. It shall hold not less than two meetings each year, and shall be governed by such constitution and by-laws not inconsistent with the constitution of this association as the section membership may adopt and the executive committee of the association approve.

Section 2. The parent association shall not be put under any obligation, either financial or in the matter of policy or opinion, by any local section.

ARTICLE IX

AMENDMENTS

Section 1. This constitution may be amended at any regular meeting by a two-thirds vote of the members present, provided that notice of the proposed amendment or amendments has been sent to the members at least 30 days previous to said regular meeting.

BY-LAWS

TIME OF MEETING

1.** The regular meeting of this association shall convene annually during the month of September, the exact date to be fixed by the Executive Committee.

PLACE OF MEETING

2.** The place of holding the annual convention shall be Chicago, Ill.

3. It shall lie within the power of the executive committee to change the location or time of the meeting if it becomes apparent that it is for the best interests of the association.

QUORUM

4. At the regular meeting of the association, 15 or more members shall constitute a quorum.

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†Amended October 17, 1940.

*Article adopted 1922.

**Amended September 20, 1948.

WOLMANIZED
Reg. U. S. Pat. Off.

Pressure-Treated Lumber and Plywood Protects Against

DECAY and TERMITES

"WOLMANIZED" treated wood prevents rot and termite damage. This clean, paintable treated material will last 3 to 5 times longer than untreated wood in severe service conditions. Approved as standard by A.R.E.A.

Both "WOLMANIZED" and "MINALITH" materials are treated by the standard vacuum-pressure process at wood preserving plants such as the above.

MINALITH
Reg. U. S. Pat. Off.

Fire-Retardant Lumber and Plywood Protects Against FIRE

"MINALITH" fire-retardant treated wood will not ignite or support combustion. Underwriters' Laboratory classifies "MINALITH" as a fire retardant, having a flame spread rating of 30. "MINALITH" treated materials are in the Federal Specifications for Fire-Retardants (Type 2) and in the Fire-Retardant standards of the American Wood-Preservers' Association.

American Lumber & Treating Co.

General Offices: 332 SOUTH MICHIGAN AVENUE • CHICAGO 4, ILLINOIS

Sales Offices in BOSTON, NEW YORK, BALTIMORE, JACKSONVILLE, FLA., LITTLE ROCK, PORTLAND, ORE., SAN FRANCISCO AND LOS ANGELES

**DUES

5. The annual dues, for the fiscal year ending August 31, and payable in advance, shall be as follows:*

Members, $5.00; Associate Members, $4.00; Junior Members, $2.50.

DUTIES OF OFFICERS

6.† The president shall have general supervision over the affairs of the association. He shall preside at all meetings of the association and of the executive committee; shall appoint all committees not otherwise provided for, and shall be ex-officio member of all committees. He shall with the secretary sign all contracts or other written obligations of the association which have been approved by the executive committee. He shall render a detailed report at least three times during the year to the members of the executive committee, showing the financial condition of the association and its activities.

At the annual meeting the president shall present a report containing a statement of the general conditions of the association.

7. The vice-presidents in order of seniority shall preside at meetings in the absence of the president and discharge his duties in case of a vacancy in his office.

8.† It shall be the duty of the secretary to keep a correct record of the proceedings of all meetings of this association, and of all accounts between this association and its members; to collect all moneys due the association, and deposit the same in the name of the association. He shall pay all bills when properly certified and approved by the president and the treasurer, and make such reports as may be called for by the executive committee. He shall also perform such other duties as the association may require.

9.‡ The treasurer shall have charge of the funds, check all deposits as made by the secretary, sign all checks after they have been approved by the president, and invest all funds not needed for current expenses as directed by the executive committee. He shall report at each annual meeting on the condition of the finances.

NOMINATING COMMITTEE

10.# After each annual meeting the president shall appoint a committee consisting of five members. Two Past Presidents shall be members of this committee, one of whom shall act as Chairman. No other officers of the Association shall be appointed to this committee. This committee shall prepare a list of names of nominees for officers to be voted on at the next annual convention in accordance with ARTICLE VI of the Constitution, said list to be read at the business session of said convention. Nothing in this section shall be construed to prevent any member making further nominations.

AUDITING COMMITTEE

11.‡ Prior to each annual meeting the president shall appoint a committee of three members, not officers of the association, whose duty it shall be to examine the accounts and vouchers of the secretary and the treasurer and certify as to the correctness of their accounts.

COMMITTEE ON SUBJECTS FOR DISCUSSION

12. After each annual meeting the president shall appoint a committee whose duty it shall be to prepare a list of subjects for investigation to be submitted for approval at the next convention.

COMMITTEE ON INVESTIGATION

13. After the association has adopted the list of subjects for investigation the president for the succeeding year shall appoint the committees who shall prepare the subjects for report and discussion. He may also appoint individual members to prepare reports on special subjects, or to report on any special or particular subject.

---

†Amended October 17, 1940.
‡Adopted October 17, 1940.
*Amended October 16, 1941.
**Amended September 20, 1948.
#Amended December 4, 1950.

STRUCTURAL RIB BOLTS

Better than rivets

• • • for bridges and trestles
• • • for general steel construction

STRUCTURAL RIB BOLTS offer many advantages over rivets for steel work. When driven into a hole in the work with an ordinary hammer, the triangular ribs deform to make a body-bound fit and lock bolt in position. Only two men with a hammer and wrench are needed to apply; riveting requires three or four men with riveting forge, compressor, and riveting hammer. Fast, stronger, dependable, they assure lower construction costs. Use them with ANCO nuts for permanency.

STRUCTURAL RIB BOLTS, equipped with Anca Lock Nuts, have been approved in place of field-driven rivets for many types of steel erection since 1937, in practically every state and in several foreign countries. They have been approved by the U. S. Treasury Department, Division of Architecture, City Building Code Authorities, and State Highway Department based on the results of many tests, including those of Robert W. Hunt Company and the University of Wisconsin.

The STRUCTURAL RIB BOLT has

- • • A HIGHER TENSILE VALUE than rivets. It is made from carbon manganese steel, galvanized or black, with a minimum tensile strength of 70,000 lb. per sq. in. as compared to 52,000 to 62,000 lb. per sq. in. for rivets.
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- • • A HIGH BEARING, D.S. VALUE of 40,000 lb. per sq. in.

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PUBLICATION COMMITTEE

14. After each annual meeting the executive committee shall appoint a publication committee consisting of three active members whose duty it shall be to coöperate with the secretary in the issuing of the publications of the association. The assignment of this committee shall be such that at least one member shall have served on the committee during the previous year.

ORDER OF BUSINESS

15.† Call to order by president.
Opening prayer or invocation.
President's address.
Report of secretary.
Report of treasurer.
Appointment of special committees.
Reports of standing committees and presentation of papers.
Unfinished business.
New business.
Election of officers.
Installation of officers.
Adjournment.

DECISIONS

16. The votes of a majority of the members present shall decide any questions, motion or resolution which shall be brought before the association, unless otherwise provided. Unless specifically provided herein otherwise all discussions shall be governed by Robert's rules of order.

AMENDMENTS

17.† The By-Laws can be amended by a two-thirds vote of those present at any regularly called Executive Committee Meeting.

†Amended September 20 1948.

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DIRECTORY OF MEMBERS

as of January 31, 1952

(Figure after each name indicates year when member joined the association)

HONORARY MEMBERS

Bechtelheimer, A. E., (Retired) Br. Engr., C. & N. W., Chicago, Ill. (1920

Budd, Ralph (Retired), Pres., C. B. & Q., Chicago, Ill. (1927)

Buford, C. H., (Retired), Pres., C. M. St. & P., Chicago, Ill. (1946)

Crites, G. S., (Retired), Div. Engr., B. & O., Baltimore, Md. (1912)

Strate, T. H., (Retired), Div. Engr., C. M. St. P. & P., Chicago, Ill. (1918)

ACTIVE MEMBERS

A

Aaron, H. C., Supvr. B. & B., W. M., Hagerstown, Md. (1935)

Ainslie, A. F., Supvr. B. & B., N. P., Spokane, Wash. (1948)

Alvord, J. L., Dist. Per. Off., C. & O., Saginaw, Mich. (1950)

Anderson, A., Spec. Asst. Engr., N. Y. C., Chicago, Ill. (1947)

Anderson, J. L., Supvr. B. & B., M. P., Osawatomie, Kan. (1931)

Andrews, J. T., Spec. Engr., B. & O., Baltimore, Md. (1947)

Armstrong, W. F., Asst. Arch'l. Engr., C. & N. W., Chicago, Ill. (1947)

Atkinson, T. J., Supvr. of Struct., Penna., Pittsburgh, Pa. (1947)

B

Babbitt, J. H., Div. Engr., B. & O., Indianapolis, Ind. (1946)

Baker, B., Asst. Supvr. B. & B., C. & O., Saginaw, Mich. (1950)

Baker, R. C., Engr., of Struc., C. & E. I., Danville, Ill. (1940)

Barnhart, E. H., Div. Engr., B. & O., Garrett, Ind. (1941)

Barr, H. L., Div. Engr., C. & N. W., Boone, Ia. (1938)

Barranco, S. J., Asst. Supvr. Struc., Penna., Pittsburgh, Pa. (1951)

Bass, G. J., Gen. For. B. & B. & W. S., G. C. & S. F., Galveston, Tex. (1946)

Beam, Y. C., Asst. Mast. Carp., S. A. L., Americus, Ga. (1945)

Beaver, J. F., Ch. Engr. M. of W. & Struc., Sou., Charlotte, N. C., (1950)

Begeman, W. H., Supvr. B. & B., M. P., Jefferson City, Mo. (1941)

Begley, J. G., Div. Engr., B. & O., Washington, Ind. (1946)

Benjamin, H. I., Vice Chair. Sys., Com. on Ins., S. P., San Francisco, Calif. (1922)

Benson, C. E., Gen. For. B. & B., E. J. & E. Chicago, Ill. (1951)

Benson, G. W., Supt. Bridges, C. of Ga., Macon, Ga. (1940)

Bergeron, J. A., Asst. B. & B. Mast., C. N. R., Parent, Que., Canada. (1949)

Beringer, M. A., Br. Insp., I. C., Chicago, Ill. (1929)

Beynon, H. G., B. & B. Mast., C. P. R., Brandon, Man. Canada (1951)

Bingaman, C. E., Mast. Carp., Reading, Tamaqua, Pa. (1948)

Bisbee, R. D., Div. Engr., P. & S. F., Slaton, Texas. (1947)

Blankenship, O. H., W. S. For., M. P., Poplar Bluff, Mo. (1948)

Blewer, E. H., Asst. Supt. Safety, N. Y. C., New York, N. Y. (1937)

Bliss, J. J., Gen. B. & B. For., Belt Ry., Chicago, Ill. (1950)

Block, M., Engr. of Br., I. C., Chicago, Ill. (1948)

Bober, H., B. & B. Engr., G. M. & O., Mobile, Ala. (1947)

Bodie, B. V., Ch. Engr., G. M. & O., Mobile, Ala. (1951)

Boehling, H. A., Jr., Asst. Cost. Engr., C. & O., Richmond, Va. (1948)

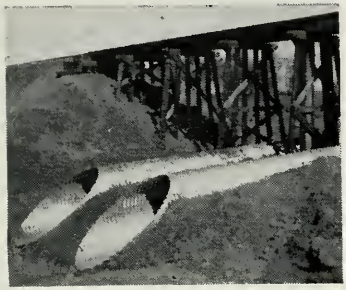
Bogle, W. H., Engr. M. W., Port Term. R. R. Assn., Houston, Texas. (1951)

Boling, E. C., Supvr. B. & B., N. S., Cary, N. C. (1950)

Borchert, W. C., Div. Engr., K. C. S., Shreveport, La. (1942)

Bost, M. A., Asst. Engr., C. M. St. P. & P., Mason City, Ia. (1935)

"Retirement plan" for weary trestles



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Brandimarte, J. J. Jr., Supvr. Struc., Penna., Cleveland, Ohio. (1947)
Brice, W. T., B. & B. Mast., C. N. R., Regina, Sask., Canada. (1946)
Bridjette, E. C., Sr-Asst. B. & B. Supvr., S. P., Los Angeles, Calif. (1950)
Brouse, R. G. Sr., Mast. Carp., C. B. & Q., Chicago, Ill. (1951)
Brown, E. J., Engr. Trk., C. B. & Q., Chicago, Ill. (1947)
Brown, L. W., Supvr. B. & B., C. & O., Peru, Ind. (1951)
Brown, T. W., Ch. Water Chem., I. C., Chicago, Ill. (1947)
Bryant, C. O., Div. Engr., C. R. I. & P., Kansas City, Mo. (1950).
Buckmaster, W. A., Asst. Div. Engr., B. & O. C. T., Chicago, Ill. (1951)
Budzenski, F. N., Asst. Supvr. B. & B., C. & N. W., Antigo, Wis. (1938)
Bunch, A. H., Br. Insp., St. L.-S. F., Springfield, Mo. (1951)
Bunge, W. H., Asst. Engr., M. P., Houston, Tex. (1941)
Burch, Edgar E., Br. Engr., C. M. St. P. & P., Chicago, Ill. (1945)
Burford, A. E., Gen. For. B. & B., I. C., Memphis, Tenn. (1947)
Burke, W. R., Supvr. B. & B., I. C., Champaign, Ill. (1947)
Burkel, J. N., Draftsman, M. P., St. Louis, Mo. (1951)
Burks, C. H., Div. Engr., S. A. L., Jacksonville, Fla. (1951)
Burrows, C. D., Mast. Carp., B. & O., Wilmington, Del. (1946)
Burrows, G., Asst. Supvr. B. & B., M. P., St. Louis, Mo. (1950)

C

Caines, W. W., Supvr. B. & B., C. & O., Huntington, W. Va. (1938)
Caldwell, F. O., Asst. Mast. Carp., S. A. L., Jacksonville, Fla. (1951)
Campbell, F. G., Ch. Engr., E. J. & E., Joliet, Ill. (1936)
Campbell, J. A., Asst. Supvr. Struc., Penna., Columbus, Ohio. (1951)
Carlon, J. G., Asst. Supvr. B. & B., C. & O., Russell, Ky. (1947)
Carothers, M. D., Asst. Ch. Engr., G. M. & O., Bloomington, Ill. (1938)
Carter, J. W., Supvr. B. & B., Virginian, Roanoke, Va. (1947)
Cassidy, R. W., Asst. Supvr. B. & B., C. & O., Richmond, Va. (1949)
Chamberlain, P. C., Asst. to Engr. of Struc., Erie, Cleveland, Ohio. (1941)
Chaney, A. B., Asst. Ch. Eng. Sys. Maint., M. P., St. Louis, Mo. (1947)
Chapin, S. L., Saf. Supvr., S. P., San Francisco, Calif. (1946)
Chapman, A. B., Asst. Ch. Engr., C. M. St. P. & P., Chicago, Ill. (1938)
Chinn, A., Pres. Term. R.R. Assoc. of St. Louis, Mo. (1930)
Christianson, H. B., Asst. Ch. Engr. of Sys., C. M. St. P. & P., Chicago, Ill. (1928)
Clapper, L., Ch. Engr., D. M. & I. R., Duluth, Minn. (1919)
Clark, K. L., Prin. Asst. Engr., C. M. St. P. & P., Milwaukee, Wis. (1939)
Cole, G., Gen. For. B. & B., A. T. & S. F., Burlingame, Kan. (1949)
Collette, E. L. Sr., Div. Engr., St. L.-S. F., Fort Smith, Ark. (1949)
Collier, P. B., Supt. of Scales, M. P., St. Louis, Mo. (1938)
Collum, R. L., Mast. Carp., S. A. L., Jacksonville, Fla. (1941)
Colvin, A. A., Div. Engr., C. & N. W., Norfolk, Neb. (1937)
Colvin, C. S., Asst. Engr. Struc., M. P., Houston, Tex. (1951)
Converse, D. W., Br. Engr., A. C. & Y., Akron, Ohio. (1940)
Cook, E. F., W. S. For., M. P., Little Rock, Ark. (1947)
Coombs, G. B., Gen For. B. & B., A. T. & S. F., Fresno, Calif. (1951)
Cooper, A. W., Engr'g Insp., S. A. L., Savannah, Ga. (1951)
Copeland, A. E., Mast. Carp., C. B. & Q., LaCrosse, Wis. (1947)
Copeland, R. F., Mast. Carp., C. B. & Q., Creston, Iowa. (1950)
Corporon, F. J., Supt. Way & Struc., C. S. S. & S. B., Michigan City, Ind. (1950)
Cox, R. C., Supvr. B. & B., W. P., Sacramento, Calif. (1950)
Cramer, F. H., Br. Engr., C. B. & Q., Chicago, Ill. (1927)
Creedle, F. W., Asst. Engr. Maint., C. & N. W., Chicago, Ill. (1942)
Crews, C. H., Supvr. B. & B., I. C., Jackson, Tenn. (1947)
Croft, P. H., Asst. Engr. M. of W., I. C., Memphis, Tenn. (1947)
Crounse, W. E., Supvr. B. & B., D. & H., Carbondale, Pa. (1945)
Cruikshank, A. W., Gen. Plumb. For., D. & H., Green Island, N. Y. (1950)
Cummings, J. W., Supvr. Work Equip., D. & H., Albany, N. Y. (1947)
Cummins, C. P., Asst. Engr., M.-K.-T., St. Louis, Mo. (1948)
Cunningham, J. F., Ch. Br. Insp., B. & M., Boston, Mass. (1951)
Curie, H. D., Mast. Carp., B. & O., Garrett, Ind. (1942)

D

Davis, G. B., Supvr. B. & B., N. Y. C., Columbus, Ohio. (1942)
Davis, G. M., Asst. Supvr. B. & B., N. Y. C., Corning, Ohio. (1951)
Davis, H. E., Supvr. B. & B., N. Y. C., Chicago, Ill. (1940)
Davis, L. H., Gen. For. B. & B., A. T. & S. F., Amarillo, Tex. (1948)

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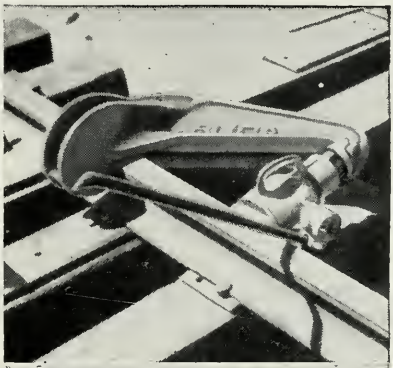
• BELOW: BUDA Rail Bender, bends heavy cold rail. One man bends 151 lb. rail easily with this handy tool.



• ABOVE: Model HBL Earth drill used for drilling foundation pier holes, false work for bridges, test borings, pinning down road bed, drilling french drains. State diameter and depth of hole when asking for literature.

• RIGHT: BUDA Klinch-Klaw Jack, ideal for pulling bolts and spikes from bridges and trestles.

WRITE FOR LITERATURE

BUDA

HARVEY *(Chicago Suburb)* ILLINOIS

Day, F. D., Supvr. Struc., Penna., Chicago, Ill. (1949)
Dedow, R. T., Draftsman, N. Y. C., Detroit, Mich. (1950)
Demmon, H. R., Asst. Gen. Insp. B. & B., S. P., Albany, Calif. (1948)
Deno, A. H., Supvr. B. & B., C. & N. W., Green Bay, Wis. (1941)
Deno, L. J., Div. Engr., C. & N. W., Escanaba, Mich. (1947)
Derry, L. N., Steel Insp., B. & M., Boston, Mass. (1951)
DeWalt, A. R., Office Engr., Penna., Cleveland, Ohio. (1949)
Dick, H. M., Supvr. Struc., Penna., Harrisburg, Pa. (1942)
Dick, M. H., Ed., Ry. Engr. & Mtce., Chicago, Ill. (1937)
Dixon, N., B. & B. Mast., C. N., Montreal, Que., Canada. (1949)
Dodson, F., Asst. Supvr. B. & B., C. & O., Covington, Ky. (1948)
Dorland, A. G., (Ret.) Asst. Engr., E. J. & E., Joliet, Ill. (1941)
Dougherty, J. L., Supvr. B. & B., W. M., Cumberland, Md. (1944)
Dove, R. E., Asso. Ed., Ry. Engr. & Mtce. Chicago, Ill. (1934)
DuBose, C. R., Res. Engr., M. P., Houston, Tex. (1948)
Duchac, J. V., Supvr. B. & B., C. & N. W., Antigo, Wis. (1927)
Dulik, A. E., Gen. For. B. & B., Penna., Harrisburg, Pa. (1950)
Dunnagan, J. P., Engr. Br., S. P., San Francisco, Calif. (1943)
Duresky, F., Jr., Supvr. B. & B., C. & N. W., Huron, S. D. (1942)

E

Ebbens, J., Supvr. B. & B., C. & W. I., Chicago, Ill. (1947)
Edlund, O. F., Supvr. W. S. & Equip., B. Ry. of Chicago, Chicago, Ill. (1950)
Eichenlaub, C. M., Res. Engr., S. D. & A. E., San Diego, Calif. (1943)
Eisele, C., Asst. Engr., N. Y. C., Chicago, Ill. (1930)
Elliott, C. E., Div. Engr., W. P., Sacramento, Calif. (1950)
Elower, L., Trav. Br. Insp., Erie, Owego, N. Y. (1948)
Enger, E. M., Supvr. B. & B., C. St. P. M. & O., St. Paul, Minn. (1947)
Engman, N. V., Asst. to Secy., A. R. E. A., Chicago, Ill. (1949)
Engman, V. E., Ch. Carp., C. M. St. P. & P., Savanna, Ill. (1920)
Erickson, J. M., Supvr. B. & B., Wabash, Montpelier, Ohio. (1950)
Erickson, O., Asst. Supvr. B. & B., S. P., Sacramento, Calif. (1950)
Ernst, F. A., Div. Engr., B. & O., Pittsburgh, Pa. (1949)
Ester. E. J., Asst. Supvr. B. & B., N. Y. C., Indianapolis, Ind. (1951)

F

Fiducia, S. F., Arch., N. Y. C., Detroit, Mich. (1950)
Firehammer, L. M., Supvr. B. & B., Ill. Term., Springfield, Ill. (1919)
Fisher, G. R., B. & B. Mast., C. N. R., Stratford, Ont., Canada. (1949)
Ford, A. N., Supvr. Bldg. Repairs, A. C. L., Savannah, Ga. (1950)
Forseth, C. E., Div. Engr., W. P., Elko, Nev. (1950)
Fouts, K., Gen. For. B. & B. & W. S., St. L.-S. F., Chaffee, Mo. (1948)
Fox, R. L., Div. Engr., Sou., Alexandria, Va. (1935)
Friets, C. G., Supvr. B. & B., C. & N. W., Escanaba, Mich. (1938)
Fronabarger, H. C., Supvr. B. & B., T. & P., Ft. Worth, Texas. (1949)
Frost, L. M., Supvr. B. & B., G. T. W., Battle Creek, Mich. (1938)
Fuhr, W. E., Div. Engr., C. M. St. P. & P., Miles City, Mont. (1948)
Furniss, B. J., Supvr. B. & B., N. Y. N. H. & H., Hartford, Conn. (1946)

G

Gabrio, C. W., Br. Engr., Virginian, Norfolk, Va. (1947)
Gannon, J. P., Div. Engr., M. St. P. & S. Ste. M., Stevens Point, Wis. (1947)
Garcelon, C. E., Supt. B. & B., B. & A., Houlton, Me. (1945)
Garis, L. D., Gen. Br. Insp., C. & N. W., Chicago, Ill. (1930)
Gearhart, G. W., Asst. Supvr. B. & B., N. & W., Roanoke, Va. (1950)
Geyer, C. J., V. P., C. & O., Richmond, Va. (1928)
Gilbert, L. C., Sr-Engr., E. J. & E., Joliet, Ill. (1950)
Giles, J. M., Asst. Engr. Rdway Mach., M. P., St. Louis, Mo. (1938)
Gillespie, W. G., Mast. Carp., B. & O., Grafton, W. Va. (1946)
Gilmore, R. W., Gen. Br. Insp., B. & O., Cincinnati, Ohio. (1943)
Gladwin, F. E., Supvr. B. & B., N. W. P., San Rafael, Calif. (1950)
Glander, A. M., Ch. Carp., C. M. St. P. & P., Mason City, Ia. (1936)
Goodin, D. W., Asst. Supvr. B. & B., N. Y. C., Columbus, Ohio. (1951)
Goodman, J. R., Supvr. Trk., Sou., Keysville, Va. (1951)
Graham, H. E., Asst. Supt. W. S., I. C., Chicago, Ill. (1946)
Graham, W. R., Asst. Supvr. B. & B., C. & O., Covington, Ky. (1946)
Greene, E. A., Asst. Supvr. B. & B., B. & M., Greenfield, Mass. (1951)
Greene, H. P., Supvr. Struct., Penna., Philadelphia, Pa. (1947)
Gunderson, R. R., Asst. Br. Engr., Sou., Washington, D. C. (1947)

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CAST IRON PIPE SERVES FOR CENTURIES

Gustafson, J. M., Br. Engr., M. & St. L., Minneapolis, Minn. (1949)

H

Hagenmaier, C. E., Asst. Supvr. B. & B., S. P., Los Angeles, Calif. (1950)
Hailey, S. H., Sr-Asst. Engr., N. C. & St. L., Nashville, Tenn. (1948)
Haines, P. D., Supvr. B. & B., C. & O., Saginaw, Mich. (1943)
Hamill, A., B. & B. Master, E. & N., Victoria, B. C., Canada. (1949)
Hamilton, C. W., Engr. of Design, Wabash, St. Louis, Mo. (1950)
Hampton, A. A., Asst. Supvr. B. & B., M. P., DeQuincy, La. (1947)
Hancock, J. S., Br. Engr., D. T. & I., Dearborn, Mich. (1916)
*Hardenberg, R. J., Draftsman, N. Y. C., Detroit, Mich. (1949)
Harding, C. R., President, The Pullman Co., Chicago, Ill. (1924)
Harlow, H. M., Asst. Gen. Supvr. B. & B., C. & O., Richmond, Va. (1939)
Harman, W. C., Supvr. B. & B., S. P., San Francisco, Calif. (1911)
Harp, M. J., Supvr. B. & B., M. P., Poplar Bluff, Mo. (1938)
Harris, A. R., Br. Engr., C. & N. W., Chicago, Ill. (1940)
Hartley, L. M., Mast. Carp., S. A. L., Tampa, Fla. (1949)
Hartman, G. F., Asst. Supvr. B. & B., C. & O., Columbus, Ohio. (1947)
Harwood, M. S., Asst. Supvr. B. & B., S. P., San Francisco, Calif. (1948)
Hawkins, C. L., Asst. Supvr. Struct., Penna., Pittsburgh, Pa. (1950)
Healy, J. J., Asst. Supvr. B. & B., B. & M., Boston, Mass. (1947)
Heck, J. E., Supvr. B. & B., C. & O., Ashland, Ky. (1938)
Hecker, R. L., Asst. Supvr. B. & B., C. & O., Grand Ledge, Mich. (1947)
Hedley, W. J., Asst. Ch. Engr., Wabash, St. Louis, Mo. (1950)
Hellweg, R. D., Asst. Div. Engr., G. M. & O., Bloomington, Ill. (1947)
Hemstad, B., Mast. Carp., G. N., Willmar, Minn. (1937)
Herrick, H. R., Sr.-Asst. Supvr. B. & B., S. P., El Paso, Tex. (1950)
Hewitt, F. W., Dist. For., Cen. Vt., West Townshend, Vt. (1951)
Hickok, B. M., Supvr. B. & B., N. Y. C., Cleveland, Ohio. (1951)
Hillman, A. B., Asst. Ch. Engr., B. Ry. of C. and C. & W. I., Chicago, Ill. (1942)
Hiner, J. T., Supvr. B. & B., Sou., Greenville, S. C. (1950)
Hodnett, E. F., Asst. Engr., M. P., Houston, Texas. (1951)
Hofstetter, P. W., Asst. Supvr. B. & B., M. P., San Antonio, Tex. (1946)
Holderman, H. L., Supvr. Wood Preserv., C. & N. W., Escanaba, Mich. (1951)
Holmes, J. L., Supvr. B. & B., N. Y. N. H. & H., New Haven, Conn. (1949)
Hornig, F. F., Div. Engr., C. M. St. P. & P., Mason City, Iowa. (1947)
Hornung, K. E., Arch., C. M. St. P. & P., Chicago, Ill. (1949)
Howard, N. D., Secretary, A. R. E. A., Chicago, Ill. (1926)
Howard, W. A., Asst. Supvr. B. & B., T. & N. O., Ennis, Texas. (1950)
Howay, B. J., Supvr. B. & B. & W. S., C. & O., Grand Ledge, Mich. (1919)
Hoyt, A. C., Engr. B. & B., E. J. & E., Joliet, Ill. (1947)
Hubbard, M. J., Gen. Supvr. B. & B., C. & O., Richmond, Va. (1948)
Huckaby, V. T., Steel Br. Insp., M.-K.-T., Hillsboro, Tex. (1947)
Huckstep, W. A., Gen. Bldg. Supvr., M. P., St. Louis, Mo. (1941)
Hueni, N. E., Asst. Engr., M. P., Houston, Tex. (1949)
Huffman, W. H., Div. Engr., C. & N. W., Chicago, Ill. (1941)
Hull, F. G., Supvr. B. & B., C. & O., Blenheim, Ont. Canada. (1947)
Humphreys, R. W., Div. Engr., N. P., Missoula, Mont. (1947)
Huntsman, F. C., Div. Engr., Wabash, St. Louis, Mo. (1922)
Huston, P. F., Mast. Carp., C. & S., Denver, Colo. (1948)
Hutcheson, F. W., Supvr. B. & B., C. & O., Newport News, Va. (1938)
Hutcheson, W. A., Supvr. Work Equip., C. & O., Clifton Forge, Va. (1939)
Hutchings, V. W., Supvr. B. & B., S. P., Bakersfield, Calif. (1941)
Hutchinson, D. G., B. & B. Insp., W. P., Elko, Nev. (1950)
Hutto, J. E., Res. Engr., S. A. L., Savannah, Ga. (1951)

I

Inabinet, J. V., Gen. Br. Insp., S. A. L., Norfolk, Va. (1948)
Inmann, J. A., Gen. For. B. & B., St. L.-S. F., Chaffee, Mo. (1947)

J

Jackman, H. E., Mast. Carp., B. & O., Chillicothe, Ohio. (1944)
Jackson, S. M., Prin. Asst. Engr., M. P., Houston, Tex. (1951)
Jackson, T. E., Gen. Supvr. B. & B., S. P., San Francisco, Calif. (1942)
Jarratt, M., Supvr. W. & F., S. P., Tucson, Ariz. (1950)
Jenkins, D. H., Supvr. B. & B., St. L. S. W., Pine Bluff, Ark. (1950)
Jenkins, H. W., Asst. Div. Engr., N. Y. N. H. & H., Boston, Mass. (1940)
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Johnson, D. H., Supvr. B. & B., C. St. P. M. & O., Eau Claire, Wis. (1940)
Johnson, H. T., Asst. Supvr. Struc., Penna. Wilmington, Del. (1949)
Johnston, G. H., Gen. For. B. & B., A. T. & S. F., Marceline, Mo. (1950)
Jones, A. C., Supvr. B. & B., Sou., Birmingham, Ala. (1938)
Jones, E. B., Br. Insp., C. & O., Clifton Forge, Va. (1945)
Jorlett, J. A., Asst. Engr., Penna., New York, N. Y. (1946)

K

Karwich, W. P., Trav. Insp. B. & B., Erie, Wadsworth, Ohio. (1948)
Kelly, F. A., Supvr. B. & B., N. Y. N. H. & H., Providence, R. I. (1949)
Kelso, R. A., Supvr. B. & B., Sou., Valdosta, Ga. (1949)
Kemmerer, W. G., Asst. Engr. B. & B., Penna., New York, N. Y. (1931)
Kendall, J. T., Spec. Duty For., Penna, Terre Haute, Ind. (1949)
Kiley, W. E., Asst. Supvr., B. & B., B. & M., Boston, Mass. (1951)
Kimball, L. P., Engr. of Bldgs., B. & O., Baltimore, Md. (1921)
Klingaman, C. C., Mast. Carp., Reading, Reading, Pa. (1951)
Klinger, T. R., Prin. Asst. Engr., M. St. P. & S. S. M., Minneapolis, Minn. (1951)
Knapp, P., Mast. Carp., Erie, Jersey City, N. J. (1951)
Koehler, P. L., Asst. Supt., C. & O., Peach Creek, W. Va. (1938)
Koenig, M. E., Supvr. B. & B., C. & N. W., Madison, Wis. (1951)
Krefting, A. S., Prin. Asst. Engr., M. St. P. & S. S. M., Minneapolis, Minn. (1935)
Kruse, H. H., Ch. Carp., C. M. St. P. & P., Miles City, Mont. (1947)
Kvenberg, S. E., Asst. Engr., C. M. St. P. & P., Chicago, Ill. (1932)

L

LaBat, J. J., Supvr. B. & B., M. P., Wichita, Kan. (1937)
Laird, C. W., Scale Supt., M. P., Houston, Tex. (1947)
Lamport, L. R., Engr. Mtce., C. & N. W., Chicago, Ill. (1935)
Lampson, W., Supvr. B. & B., M. C., Portland, Me. (1930)
*Landregan, R. J., Asst. on Engr'g. Corps, C. & E. I., Danville, Ill. (1950)
Langford, W. A., Asst. Supvr. B. & B., M. P., Monroe, La. (1948)
Larson, Krist, Supvr. B. & B., C. & N. W., Sioux City, Ia. (1947)
League, W. T., Supvr. Struc., Penna, Pittsburgh, Pa. (1949)
Leak, V. L., Gen. For. B. & B. & W. S., St. L.-S. F., Tulsa, Okla. (1948)
*Lederer, C. C., Designer B. & B. Dept., N. Y. C., Detroit, Mich. (1949)
Lee, F. L., Supvr. Struct., Penna., Cincinnati, Ohio. (1951)
Lehman, H. G., Sr. Asst. Supvr. B. & B., S. P., San Francisco, Calif. (1950)
Leinweber, F. J. A., B. & B. Mast., C. N. R., St. Thomas, Ont., Canada. (1947)
Lieser, H. J., Supvr. Trk., Belt Ry. of Chgo., Chicago, Ill. (1948)
Lingle, T. N., Gen. For. B. & B., I. C., Carbondale, Ill. (1951)
Linn, G. A., Div. Engr., C. & N. W., Chadron, Neb. (1940)
Little, C. A., Asst. Supvr. B. & B., B. & M., Concord, N. H. (1918)
Little, H. C., Supvr. W. S., I. C., Vicksburg, Miss. (1948)
Lokotzke, G. P., Supvr. B. &. B., E. J. & E., Gary, Ind. (1947)
Loper, L. E., Asst. Mast. Carp., Erie, Hornell, N. Y. (1951)
Lorber, R. J., Supvr. B. & B., P. & P. U., Peoria, Ill. (1948)
Lord, H. T., B. & B. Mast., C. P. R., Kenora, Ont., Canada. (1940)
Lorence, H. B., Fire Prot. Engr., C. R. & I. (NYC), Hammond, Ind. (1950)
Lowry, J. M., Asst. to Ch. Engr., St. L. S. W., Tyler, Texas. (1950)
Luck, R. P., Draftsman, C. & N. W., Chicago, Ill. (1920)
Lund, C. V., Asst. Engr., C. M. St. P. & P., Chicago, Ill. (1947)
Lyon, L. E., Div. Engr., S. P., El Paso, Tex. (1947)

Mc

McCauley, M. L., Asst. Engr. Struct., N. Y. C., Elmhurst, Ill. (1950)
McCay, J. F., Insp. B. & B., N. Y. C., Chicago, Ill. (1945)
McDonald, J. W., Gen. For., B. & B. & W. S., St. L.-S. F., Springfield, Mo. (1947)
McElreath, C. S., Supvr. B. & B., Sou., Atlanta, Ga. (1951)
McGrew, B. H., Supvr. B. & B., St. L. S. W. of T., Tyler, Tex. (1951)
McGrew, F. O., Ch. Carp., C. M. St. P. & P., Terre Haute, Ind. (1948)
McKee, E. R., Asst. Div. Engr., B. & O., Washington, Ind. (1947)
McKibben, D. H., Asst. Supvr. Struct., Penna. Buffalo, N. Y. (1951)
McNairy, W. H., Asst. Div. Engr., Sou., Charlotte, N. C. (1951)
McNally, P. F., Supvr. B. & B., S. P., Ogden, Utah. (1948)

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Manley, B. F., Supvr. B. & B., P. E., Los Angeles, Calif. (1943)
Manning, D. A., Supvr. B. & B., C. & N. W., Chicago, Ill. (1939)
Manning, W. K., Supvr. Br., Erie, Port Jervis, N. Y. (1948)
Marshall, R. B., Asst. Engr., C. & O., Richmond, Va. (1949)
Martens, W. F., Gen. For. B. & B., A. T. & S. F., San Bernardino, Calif. (1924)
Martin, G. E., Supt. W. S., I. C., Chicago, Ill. (1942)
Martin, J. U., Mast. Carp., S. A. L., Raleigh, N. C. (1946)
Martin, S. L., Asst. Supvr. B. & B., T. & N. O., LaFayette, La. (1951)
Martin, T. J., Gen. Mast. Carp., G. N., Seattle, Wash. (1940)
Mason, E. L., Supvr. B. & B.. M. P., Kingsville, Tex. (1946)
Mason, S. K., Ch. Engr., Texas Mexican, Laredo, Tex. (1950)
Mateer, W. G., Mgr. of Pur. & Stores, E. J. & E., Chicago, Ill. (1944)
Mathis, R. C., Insp. Bridges, I. C., Memphis, Tenn. (1947)
Matthews, A. N., Gen. For. B. & B. & W. S., St. L.-S. F., Fort Scott, Kan. (1947)
Matthews, H. A., Gen. For. B. & B. & W. S., St. L.-S. F., Memphis, Tenn. (1949)
May, L. E., For. B. & B., A. T. & S. F., Fresno, Calif. (1948)
Mayfield, L., Res. Engr., M. P., Houston, Tex. (1944)
Mays, J. W. N., Supvr. Struc., Penna., Pittsburgh, Pa. (1947)
Meeks, W. R., Supvr. B. & B., M. P., Falls City, Neb. (1942)
Meredith, W. E., Supvr. Struc., Penna. Columbus, Ohio. (1950)
Merrill, B. W., Supvr. B. & B., N. Y., C. & St. L., Conneaut, Ohio. (1936)
Meserve, E. S., Asst. Supvr. B. & B., B. & M., Dover, N. H. (1949)
Meyers, B. R., Asst. Ch. Engr., C. & N. W., Chicago, Ill. (1930)
Michael, H. E., Asso. Ed. Railway Age, Chicago, Ill. (1947)
Miller, J. G., Mast. Carp., B. & O., Connellsville, Pa. (1949)
Miller, R. S., Bldg. Supt., C. R. I. & P., Chicago, Ill. (1949)
Minnis, H. D., Jr., Trk. Supvr., Sou., Orangeburg, S. C. (1951)
Misch, F. M., Gen. Supvr. B. & B., S. P., San Francisco, Calif. (1937)
Mitchell, D. N., Asst. Supvr. B. & B., C. & O., Newport News, Va. (1948)
Mitchell, W., Supvr. Struc., Penna., Harrington, Del. (1949)
Moore, A. J., Br. Insp., M. P., Eunice, La. (1950)
Moore, I. A., Asst. Ch. Engr., C. & E. I., Danville, Ill. (1937)
Moreland, H. B., Supvr. B. & B., Sou., Wilton, Ala. (1951)
Morgan, J. H., Engr. M. W., F. E. C., St. Augustine, Fla. (1948)
Morgan, L. R., Fire. Prev. Engr., N. Y. C., Detroit, Mich. (1937)
Morrison, R. H., Prin. Asst. Engr., B. & A., Houlton, Me. (1941)
Moser, C. A., Supvr. B. & B., S. N., Sacramento, Calif. (1951)
Mottier, C. H., V. P. & Ch. Engr., I. C., Chicago, Ill. (1942)
Myers, R. L., Supvr. W. S., I. C., Clarksdale, Miss. (1950)

N

Neal, G. W., Supt., C. V., West Point, Ga. (1948)
Neely, Z. D., Mast. Carp., B. & O., Washington, Ind. (1950)
Nelson, R. A., Engr. of Bldgs., C. G. W., Chicago, Ill. (1948)
Nicely, O. P., Asst. Supvr. B. & B., C. & O., Clifton Forge, Va. (1950))
Norris, H., Asst. Supvr. B. & B., F. E. C., Miami, Fla. (1948)
Norton, R. L., Mast. Carp., S. A. L., Savannah, Ga. (1951)
Nuckols, L. T., Ch. Engr., C. & O., Richmond, Va. (1951)

O

Oest, W. C., Prin. Asst. Engr., Ft. W. & D. C., Ft. Worth, Tex. (1947)
Olson, V. E., Supvr. B. & B., M. St. P. & S. S. M., Stevens Point, Wis. (1948)
Ornburn, B. J., Asst. Ch. Engr. Struc., C. M. St. P. & P., Chicago, Ill. (1948)
Osbourne, T. D., Asst. Gen. Br. Insp., S. P., San Francisco, Calif. (1950)
Overdahl, C. N., Asst. Supvr. B. & B., N. P., Tacoma, Wash. (1948)
Oviatt, M. P., Supvr. B. & B., C. N. O. & T. P., Selma, Ala. (1949)

P

*Pahl, W. H., Jr., Asst. Supvr. Struc., Penna., Indianapolis, Ind. (1950)
Park, E. Jr., Draftsman, M. P., Houston, Tex. (1948)
Parrish, E. L., Supvr. B. & B., I. C., Vicksburg, Miss. (1947)
Patenaude, E., B. & B. Mast., C. P. R., Sudbury, Ont., Canada. (1930)
Paulson, R. E., Ch. Draftsman, C. M. St. P. & P., Chicago, Ill. (1945)
Pederson, W. E., Supvr. B. & B., M. St. P. & S. S. M., Superior, Wis. (1950)
Peek, J. M., Asst. Supvr. B. & B., Sou. Greenville, S. C. (1951)
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Pennington, L. R., Supvr. B. & B., C. & N. W., Chadron, Neb. (1938)
Perry, C., Asst. Supvr. B. & B., C. & O., Ashland, Ky. (1950)
Perry, G. H., Supvr. Struc., Penna., New York, N. Y. (1948)
Peterson, J. C., Sr. Asst. Supvr. B. & B., S. P., Sacramento, Calif. (1950)
Peterson, N. E., Ch. Engr., C. & I. M., Springfield, Ill. (1938)
Petteys, W. F., Div. Engr., Erie, Youngstown, Ohio. (1948)
Peyser, L. E., Arch., S. P., San Francisco, Calif. (1937)
Pfeiffer, A., Asst. Supvr. B. & B., S. P., Sacramento, Calif. (1939)
Phelps, C. E., Supvr. B. & B., Georgia, Camak, Ga. (1949)
Philips, R. J., Asst. Supvr. B. & B., N. Y. N. H. & H., Edgewood, R. I. (1951)
Phillips, B. C., Mast. Carp., C. B. & Q., Alliance, Neb. (1947)
Phillips, W. J., Asst. Gen. Br. Insp., S. P., San Francisco, Calif. (1925)
Pinard, T. W., Ch. Engr., L. I., Jamaica, N. Y. (1920)
Plechner, E. J., B. & B. Insp., Reading, Philadelphia, Pa. (1950)
Podas, N. F., Ch. Engr., St. P. U. D. & Minn. Trans., St. Paul, Minn. (1937)
Preston, C. W., Engr. Pro. Ctgs., B. & O., Baltimore, Md. (1950)
Priest, G. H., Gen. For. B. & B., C. N. R., Belleville, Ont., Canada. (1948)
Prude, G. F., Asst. Supvr. B. & B., T. & N. O., Houston, Tex. (1951)
Pryor, W. H., Gen. For. B. & B. & W. S., St. L.-S. F., Memphis, Tenn. (1946)

R

Radford, W. C., Div. Engr., Sou., Richmond, Va. (1951)
Raessler, V. D., Supvr. B. & B., I. C., Memphis, Tenn. (1951)
Raley, W. F., Mast. Carp., B. & O., Callery, Pa. (1949)
Ransom, R. D., Div. Engr., C. & N. W., Antigo, Wis. (1950)
Rapier, L. F., Supvr. B. & B., G. M. & O., Bloomington, Ill. (1946)
Reece, A. N., Asst. to Pres., K. C. S., Kansas City, Mo. (1922)
Reed, C. I., Supvr. B. & B., N. Y. C., Detroit, Mich. (1949)
Reed, F. A., Supvr. B. & B., I. C., Clinton, Ill. (1947)
Reese, A. G., Dist. Mtce. Engr., C. B. & Q., Galesburg, Ill. (1947)
Reese, R. F., Supvr. B. & B., T. & N. O., Houston, Tex. (1950)
Rice, E. D., Br. Insp., C. & E. I., Danville, Ill. (1949)
Richards, W. T., Engr. Mtce. Way & Struc. W. P., San Francisco, Calif. (1950)
Richardson, H. B., Supvr. B. & B., B. & M., Dover, N. H. (1948)
Rintoul, D. T., Gen. Br. Insp., S. P., San Francisco, Calif. (1910)
Roberts, C. A., Ch. Draftsman, Erie, Cleveland, Ohio. (1948)
Robinson, G. E., Engr. Struc., N. Y. C., Chicago, Ill. (1948)
Robinson, N. R., Supvr. B. & B., S. P., Sacramento, Calif. (1934)
Rode, L. A., Gen. Br. Insp., Erie, Newark, N. J. (1948)
Routenberg, H. W., Mast. Carp., B. & O., Baltimore, Md. (1946)
Ryan, G. M., Supvr. B. & B., N. Y. N. H. & H. Boston, Mass. (1947)

S

Safley, J. R., Sr. Asst. Supvr. B. &. B., S. P., Dunsmuir, Calif. (1945)
Salmon, J. M., Jr., Ch. Engr., Clinchfield, Erwin, Tenn. (1938)
Sathre, C. O., Supvr. B. & B., C. & N. W., Norfolk, Neb. (1950)
Saunders, T. D., Ch. Engr., Ontario Northland, North Bay, Ont., Canada. (1930)
Saurer, D. E., Asst. Supvr. Struc., Penna., Logansport, Ind. (1951)
Savage, W. J., Asst. Ch. Engr., T. & P., Dallas, Tex. (1948)
Sawyer, J. H., Jr., Asst. Ch. Engr., C. G. W., Chicago, Ill. (1951)
Scherer, P. J., Supvr. B. & B., S. P., El Paso, Tex. (1936)
Scheumack, J. F., Indus. Engr., T. & N. O., Houston, Tex. (1950)
Schilt, F. F., Div. Engr., B. & O., Grafton, W. Va. (1946)
Schlaf, E. R., Asst. Supt. W. S., I. C., Chicago, Ill. (1947)
Schneider, J. C., Supvr. B. & B., T. & N. O., Victoria, Tex. (1950)
Schofield, C. E., Asst. Div. Engr., S. A. L., Savannah, Ga. (1948)
*Schrader, Harley A., Jr., Engr., Penna., Zionsville, Ind. (1951)
Schroeder, A. W., Supt., C. & E. I., Danville, Ill. (1949)
Scites, P. E., Supvr. B. & B., C. & O., Huntington, W. Va. (1950)
Seals, R. K., Trk. Supvr., Sou., Salisbury, N. C. (1951)
Seley, L. L., Mast. Carp., C. B. & Q., Hannibal, Mo. (1947)
Selvidge, B. F., Asst. to B. & B. Supvr., M. P., Monroe, La. (1951)
Setzer, C. M., Supvr. B. & B., Sou., Rock Hill, S. C. (1951)
Shackelford, A. D., Div. Engr., C. N. R., Dauphin, Man., Canada. (1950)
Shaefer, L. A., For. W. S., M. P., Osawatomie, Kan. (1948)
Sharkey, T. J., Gen. For. B. & B., Penna., Bradley Beach, N. J. (1951)

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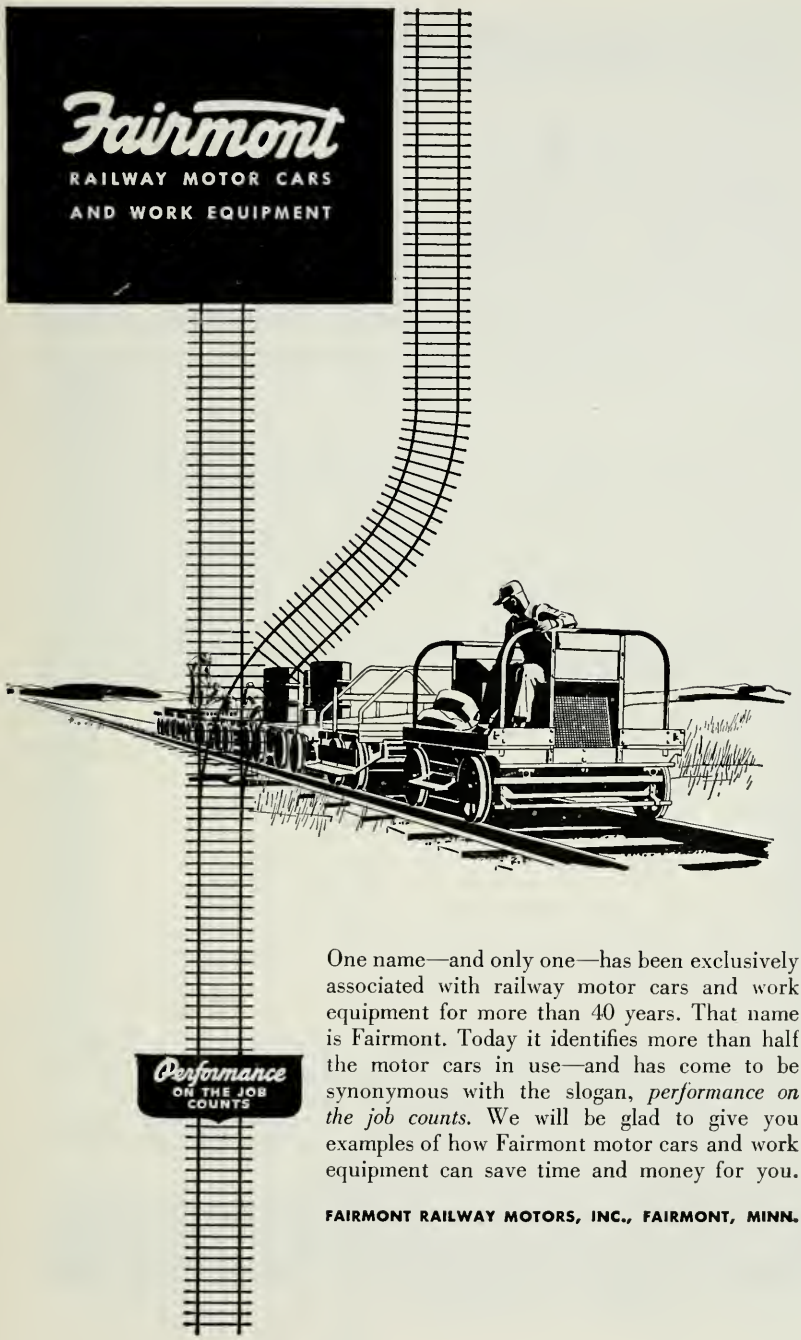

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Short, J. M., Gen. Insp. W. S., T. & P., Dallas, Tex. (1950)
Short, W. L., Br. Insp., M. P., St. Louis, Mo. (1951)
Showalter, J. R., Br. Engr., M. P., St. Louis, Mo. (1942)
Siegfried, F. A., For. Carp. B. & B., Reading, Reading, Pa. (1947)
Sims, C. C., Asst. Supvr. B. & B., C. & O., Hinton, W. Va. (1947)
Simpson, P. X., Supvr. B. & B., N. P., Tacoma, Wash. (1947)
Singer, E. W., Supvr. B. & B., N. Y. C. & St. L., Ft. Wayne, Ind. (1923)
Sirel, A. A., Asst. Structural Engr., A. A. R., Chicago, Ill. (1940)
Sitton, G. L., Asst. Ch. Engr., Sou., Washington, D. C. (1920)
Skinner, H. E., Supvr. Scales & Wk. Equip., E. J. & E., Joliet, Ill. (1944)
Slagle, G. P., Ch. Carp., C. M. St. P. & P., Milwaukee, Wis. (1948)
Smith, C. A., Supvr. B. & B., C. R. & I. and I. H. B. (N.Y.C.), Hammond, Ind. (1946)
Smith, H. E., Engr. M. of W., G. H. & H., Galveston, Tex. (1941)
Smith, J., Asst. Supvr. B. & B., S. P., Sacramento, Calif. (1943)
Smith, L. C., Div. Engr., C. & N. W., Madison, Wis. (1942)
Smith, L. L., Asst. Supvr. B. & B., S. P., Dunsmuir, Calif., (1948)
Smith, N. E., Asst. Engr., C. M. St. P. & P., Chicago, Ill. (1951)
Snyder, E. F., Asst. to Ch. Engr., I. C., Chicago, Ill. (1948)
Snyder, T. E., Mast. Carp., B. & O., Salamanca, N. Y. (1949)
Spofford, F. R., Asst. Div. Engr., B. & M., Dover, N. H. (1940)
Sprengel, H. A., Asst. Supvr. B. & B., M. P., Falls City, Neb. (1950)
Srb, R., Mast. Carp., C. B. & Q., Lincoln, Neb. (1949)
Starnes, W. B., Br. Insp., M. P., Kingsville, Tex. (1947)
Steidel, G. T., Br. Engr., L. & N. E., Bethlehem, Pa. (1946)
Stephens, B. M., Asst. Ch. Engr., T. & N. O., Houston, Tex. (1946)
Stephens, O. W., Asst. Engr. Struc., D. & H., Albany, N. Y. (1929)
Stevens, C. M., Supvr. B. & B., S. P., Portland, Ore. (1950)
Stewart, A. L. Jr., Asst. Supvr., Sou., Selma, Ala. (1950)
Stewart, F. J., Ch. Engr., Port Everglades Belt Line, Port Everglades, (Ft. Lauderdale), Fla. (1944)
Stinebaugh, J. H., Supvr. W. S., I. C., Carbondale, Ill. (1951)
Stone, V. E., Fire Insp., N. Y. C., Elkhart, Ind. (1951)
Stoneman, W. Jr., Sr. Asst. Supvr. B. & B., S. P., El Cerrito, Calif. (1949)
Strouss, J. A., Asst. Supvr. B. & B., S. P., Sacramento, Calif. (1934)
Stutzman, J. W., For. Carp., Reading, Reading, Pa. (1947)
Sumner, J., For. W. S., St. L.-S. F., Springfield, Mo. (1948)
Sweet, W. A., Gen. For. B. & B., A. T. & S. F., Newton, Kan. (1928)
Switzer, G., Asst. Div. Engr., W. P., Sacramento, Calif. (1949)

T

Taggart, C. R., Supvr. B. & B., N. Y. C., Indianapolis, Ind. (1935)
Tanner, C. L., Gen. For. B. & B. and W. S., P. & S. F., Slaton, Tex. (1948)
Taylor, F. H., Asst. Engr. M. of W. Dept., F. E. C., St. Augustine, Fla. (1951)
Taylor, W. L., Supvr. B. & B., Sou., Jasper, Ala., (1950)
Templin, R. S., For. Carp., Reading, St. Clair, Pa. (1947)
Tetrault, L. J., For. B. & B., N. Y. N. H. & H., Worcester, Mass. (1936)
Thelander, P. V., Asst. Engr. Mtce., C. & N. W., Chicago, Ill. (1939)
Thurman, S. R., Supvr. B. & B., M. P., Nevada, Mo. (1943)
Todd, D. C., Supvr. Struc., Penna., Pittsburgh, Pa. (1942)
Tourtellotte, E. B., Supvr. B. & B., B. & M., Greenfield, Mass. (1947)
Trulove, J. D., Sr. Asst. Supvr. B. & B., S. P., Ogden, Utah. (1945)
Tucker, N. R., Asst. Div. Engr., T. & N. O., Austin, Tex. (1939)
Tunison, H. C., Asst. Engr. M. of W., L. & N. E., Bethlehem, Pa. (1946)
Tupper, A. E., For. B. & B., S. P., Stockton, Calif. (1942)
Turner, E. F., For. Steel Const. Gang, M.-K.-T., Denison, Tex. (1950)

V

Vance, R. M., Asst. Supvr. B. & B., N. F. & G. (C.& O.), Rainelle, W. Va. (1949)
Vandenburgh, E. C., Ch. Engr., C. & N. W., Chicago, Ill. (1925)
Van Ness, R. A., Br. Engr. Sys., A. T. & S. F., Chicago, Ill. (1949)
Varker, J. L., Div. Engr., D. & H., Carbondale, Pa. (1936)
von Sprecken, R. E., Asst. Trk. Supvr., Sou., Greensboro, N. C. (1951)
von Sprecken, T. M., Asst. to Ch. Engr., Sou., Washington, D. C. (1938)

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Wager, R. O., Ch. Fire Prot. Engr., N. Y. C., New York, N. Y. (1951)
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Wallace, C. E., Gen. For. B. & B. & W. S., St. L.-S. F., Ft. Smith, Ark. (1948)
Wallace, J. E., Supvr. B. & B., M. P., St. Louis, Mo. (1950)
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Wait, R. E., Supvr. B. & B., Wabash, Decatur, Ill. (1923)
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Weatherly, H. E., Asst. Div. Engr., T. & N. O. (S.P.), El Paso, Tex. (1950)
Weatherly, J. E., Sr., Div. Engr., T. & N. O. (S.P.), Houston, Tex. (1950)
Weaver, W. R., Asst. Supt., P. & S., Kittanning, Pa. (1951)
Webber, G. R., Ch. Carp., C. M. St. P. & P., Spokane, Wash. (1948)
Webster, D. A., Trk. Supvr., D. & H., Whitehall, N. Y. (1950)
Welch, J. W., Supvr. B. & B., F. E. C., St. Augustine, Fla. (1943)
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Whitehouse, B. M., Ch. Fire Insp., C. & N. W., Chicago, Ill. (1927)
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Wiitala, A., Gen. For. B. & B., L. S. & I., Marquette, Mich. (1941)
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Williams, C., Asst. Supvr. B. & B., C. & O., Ashland, Ky. (1950)
Williams, N. H., B. & B. Mast., D. & H., Oneonta, N. Y. (1947)
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Wilson, W. E., Supvr. B. & B., I. R. of C. A., San Salvador, C. A. (1950)
Winkelhaus, L. C., Arch. Engr., C. & N. W., Chicago, Ill. (1934)
Wistrich, H. A., Asst. Ch. Engr., L. V., Bethlehem, Pa. (1938)
Witherspoon, J. P., Asst. Mast. Carp., S. A. L., Atlanta, Ga. (1948)
Wolf, J. E., Steel Br. Insp., M.-K.-T. of T., Denison, Tex. (1950)
Woodrow, R. F., Asst. Supvr. B. & B., Portland Term., Portland, Me. (1951)
Woolford, F. R., Ch. Engr., W. P., San Francisco, Calif. (1950)
Wray, H. O., Engr. M. W. & S., Texas City Term., Texas City, Tex. (1939)
Wrights, H. Supvr. B. & B., M. P., Little Rock, Ark. (1929)

Y

Yaw, D. M., Mast. Carp., Erie, Buffalo, N. Y. (1951)
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B

Batey, W. A. (Ret.), Const. Engr., U. P., 4303 South St., Lincoln, Neb. 1918
Buckingham, W. (Ret.), Br. For., M. C., 907 Chittock Ave., Jackson, Mich. 1928

C

Canty, J. P., (Ret.), Asst. to Engr. M. W., B. & M., 40 Prospect St., Melrose, Mass. 1901
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Christiansen, L. (Ret.), For. B. & B., C. M. St. P. & P., 255 So. 11th St. Marion, Ia. . . . 1928
Church, H. M. (Ret.), Gen. Supvr. B. & B., C. & O., 509 N. Blvd. Richmond, Va. 1939
Clark, W. A. (Ret.), Off. Engr., D. M. & I., 2718 E. 5th St., Duluth, Minn. 1908
Corey, S. T. (Ret.), Off. Engr. & Engr. of Br., C. R. I. & P., 7250 Harvard Ave., Chicago 21, Ill. 1913
Cota, G. M. (Ret.), Ch. Clk. Engr. Dept., Cen. Vt., St. Albans, Vt. 1913

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Decker, H. H., (Ret.), Res. Engr., C. & N. W., 2915 Ingersol Ave., Des Moines, Ia. . . . 1908
Drury, E., (Ret.), Gen. For. B. & B., A. T. & S. F., Newton, Kan. 1919

E

Elwell, H. A., Supt. B. & B., C. G. W., 1735 Marshall Ave., St. Paul, Minn. 1911

F

Flynn, M. J., (Ret.), Supvr. B. & B., C. & N. W., 2445 Coyle Ave., Chicago 45, Ill. . . . 1905

G

Gehr, B. F. (Ret.), Mast. Carp., Penna., 400 S. 14th St., Richmond, Ind. 1908
Gentis, I. (Ret.), For. B. & B., S. P., 2003 West St., Oakland, Calif. 1912
Gerst, H. A. (Ret.), Asst. Engr., G. N., 748 Aldine St., St. Paul 4, Minn. 1917
Gillette, J. E. (Ret.), Carp. For., C. M. St. P. & P., Mazomanie, Wis. 1923
Gillis, A. D. (Ret.), Supvr. B. & B., N. Y. N. H. & H., Providence, R. I. 1923
Gunderson, E. (Ret.), Supt. B. & B., C. St. P. M. & O., Altoona, Wis. 1927

H

Hadwen, T. L. D. (Ret.), Engr. Masonry Constr., C. M. St. P. & P., 1140 No. LaSalle St., Chicago 10, Ill. 1907
Hand, G. W. (Ret.), Asst. to Pres., C. & N. W., 412 Courtland Ave., Park Ridge, Ill. . . 1909
Hartwell, J. R. (Ret.), Supvr. B. & B., C. & N. W., Pierre, S. D. 1918
Heiszenbuttel, H. (Ret.), Supvr. B. & B., C. & N. W., 808 So. Third St., Norfolk, Neb. 1917
Heuss, C. W. (Ret.), Supvr. B. & B., C. C. C. & St. L. (NYC), 1840 Lexington, Indianapolis, Ind. 1919
Hillman, F. W. (Ret.), Asst. Engr. M. W., C. & N. W., 2707 Walnut Ave., Evanston, Ill. 1917
Hofacker, J. P. (Ret.), Supvr. B. & B., L. V., 54 N. Fulton St., Auburn, N. Y. 1907
Horning, H. A. (Ret.), Asst. Supt. Bldgs., M. C. (NYC), 1106 Francis St., Jackson, Mich. 1902
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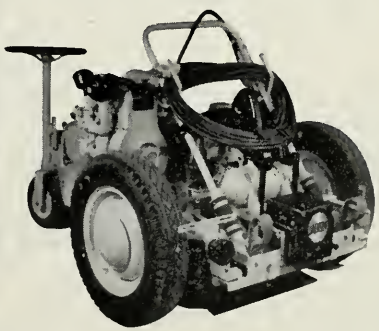

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Johnson, M. (Ret.), Prin. Asst. Engr., I. C., c/o Casa de Fresa, Hammond, La. 1915
Johnson, R. W., (Ret.), Asst. Engr., C. M. St. P. & P., 361 W. Windsor Ave., Lombard, Ill. 1922

K

Knetzger, E. J., (Ret.), For. B. & B., S. P., 3140 E. 27th St., Oakland, Calif. 1926
Koch, H. L. (Ret), Supvr. B. & B., N. Y., C. & St. L., 637 Main St., Conneaut, Ohio. . . 1922

L

Lacher, W. S. (Ret.), Sec., A. R. E. A., 440 No. Spring St., LaGrange, Ill. 1922
Lacy, W. J. (Ret.), Supvr. B. & B., M. P., 4370 Swan St., St. Louis, Mo. 1911
Landstrom, C. A. (Ret.), Supvr. B. & B., C. B. & Q., 1311 So. 3rd St., Burlington, Ia. 1928
Larsen, H. C. (Ret.), Str. Iron For., C. St. P. M. & O., 1084 Sims Ave., St. Paul 6, Minn. 1928
Lincoln, S. (Ret.), Gen. For. B. & B., G. C. & S. F., 1903 Harrison Ave., Beaumont, Texas. 1927
Lindstrom, C. G. (Ret.), For. B. & B., C. M. St. P. & P., Rockwell City, Ia. 1924
Lyman, C. R. (Ret.), For. B. & B., Cen. Vt., Waterbury, Vt. 1913

Mc

McCabe, E. M. (Ret.), Supvr. B. & B., B. & A., Rte. No. 44, Narrangansett Ave., Pittsfield, Mass. 1915
McCue, G. G. (Ret.), Supvr. B. & B., G. T., 369 Main St., Ottawa, E. Ont., Canada. . . . 1913
McElhinney, H. A. (Ret.), B. & B. Mast., C. N. R., 9 Beech St., Halifax, N. S., Canada 1923
McKay, A. G. (Ret.), Supvr. B. & B., N. Y. N. H. & H., 11 Pine Island Rd., Jupiter Pt., Groton, Conn. 1915
McMahon, T. D. (Ret.), Arch., G. N., 223 Lake Ave., White Bear Lake, Minn. 1918
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M

Masters, F. H. (Ret), Ch. Engr., E. J. & E., 907 Glenwood Ave., Joliet, Ill. 1920
Mead, E. L. (Ret.), Div. Engr., C. & N. W., 536 N. E. 69th St., Miami, Fla. 1923
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Merwin, P. B. (Ret.), Asst. Engr., C. & N. W., Rte. 2, Box 565, Washougal, Wash. 1923
Miller, C. E. (Ret.), Asst. Engr. M. of W., C. & N. W., 400 Ridge Ave., Evanston, Ill. 1916

N

Nies, A. B. (Ret.), Arch., Mich. Cent., 408 3rd St., Jackson, Mich. 1915

O

O'Brien, W. J. (Ret.), Dist. Carp., C. M. St. P. & P., Necedah, Juneau Co., Wisc. 1919

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Parker, W. V. (Ret.), Gen. For. B. & B., St. L. S. W., Berchair Station, Memphis 11, Tenn. 1911
Piccone, C. (Ret.), Br. Engr., Nat. Rys. of Mex., Monte Everest 210, Lomas de Chapultepec, Mexico City, D. F., Mex. 1923

R

Reeves, W. T. (Ret.), Con. Engr. Strl. Dept., Robt. W. Hunt Co., 1133 Judson Ave., Evanston, Ill. 1924
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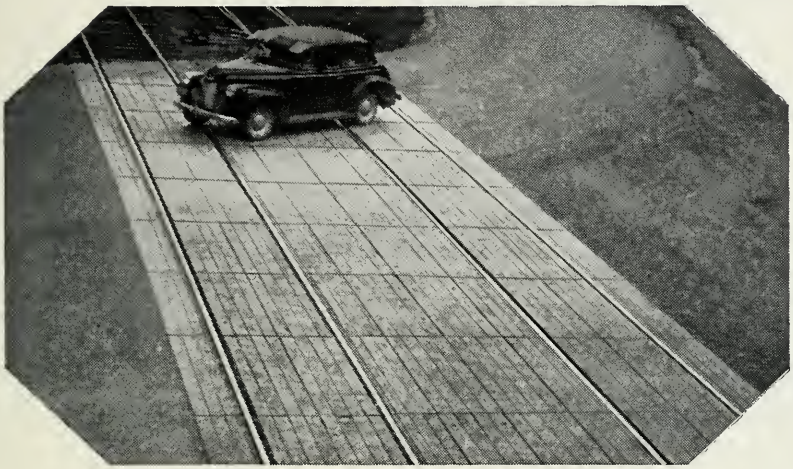

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Speaker, D. (Ret.), Mast. Carp., Penna., 813 N. 4th St., Steubenville, Ohio. 1928
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T

Talbott, J. L., Gen. For. B. & B., A. T. & S. F., 228 Park St., Morgantown, W. Va. 1905
Tattershall, E. R. (Ret.), Supvr. of Mtce. Equip. N. Y. C., 21 Coy St., Malone, N. Y. . . 1913
Taylor, F. A. (Ret.), Mast. Carp., B. & O., 2970 Mattern Ave. Dormant,
Pittsburgh, Pa. 1909

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Vance, W. H. (Ret.), Asst. Engr. M. W., M. P., 6347 Alamo Ave., Clayton 5, Mo. 1910
von Schrenk, H. (Ret.), Const. Tbr. Engr., M. P., 4030 Chouteau Ave., St. Louis, Mo. . 1916

W

Walden, W. H. (Ret.), Rdm., Sou., 1012 Porter St., Richmond 24, Va. 1920
Warren, L. A. (Ret.), Supvr. B. & B., S. P., 4221 Maple St., Sacramento 17, Calif. 1929
Watson, W. (Ret.), Supvr. B. & B., E. J. & E., 304 Leach Ave., Joliet, Ill. 1930
White, F. W. (Ret.), Supvr. B. & B., L. V., 409 S. Wilbur Ave., Sayre, Pa. 1915
White, W. E. (Ret.), Gen. For., A. T. & S. F., 706 W. 6th St., Chanute, Kan. 1920
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Wright, C. W. (Ret.), Mast. Carp., L. I., 67 Nassau Pky., Oceanside, N. Y. 1908
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Bailey, G. H., Supt. R. R. Div., Morrison-Knudsen Co., 1718 No. 15th St. Boise, Ida. 1946
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Bardwell, A. E., Western Div. Mgr., Fabreeka Products Co., 325 W. Huron St., Chicago 10, Ill. 1946
Betts, G. R., Mgr. R. R. Sales, Armco Drainage & Metal Prod. Inc., 310 S. Michigan Ave. Chicago, Ill. 1946
Bishop, D. B., Sls. Engr., Dearborn Chemical Co., 1512 Farmers Bank Bldg., Pittsburgh, Pa. 1946
Boldt, A., Contractor & Lumber Dealer, 2 West Cutting Blvd., Richmond, Calif. 1949
Bolton, J. D., John D. Bolton & Co., Gunite Contractor, 910 Custor Ave., Evanston, Ill. 1946
Borcherding, C. H., Dist. Mgr., The Master Builders Co., 2125 Maryland Ave., Baltimore 18, Md. 1947
Boulton, C. R., R. R. Contractor, 15 E. Town St., Columbus, Ohio. 1946
Brennon, L. D., M. of W. Repr., Air Reduction Sales Co., 314 Pineview Dr., Waycross, Ga. 1950
Bryant, C. E. Jr., Johns-Manville Sales Corp., 22 E. 40th St., New York, N. Y. 1951
Burkey, J. R., Constr. Engr., Union Metal Mfg. Co., 2421 Plymouth Ave., Columbus 9, Ohio. 1942
Burpee, C. M., V. P., Sls. Pro. Serv., Simmons-Boardman Pub. Corp., 70 Church St. New York 7, N. Y. 1930
Buskirk, G. C., Repr., Pacific Coast Borax Co., 5012 Cedar Ave., S. Minneapolis 17, Minn. 1949

C

Canning, J. F., President, Southwestern Petroleum Co., P.O. Box 789, Ft. Worth, Texas 1949
Clapp, K. J., Asst. Sales Mgr., Homelite Corp., Port Chester, N. Y. 1946
Clarke, R., Res. Mgr., Massey Concrete Prod. Co., 111 W. Washington St., Chicago 2, Ill. 1948
Claybaugh, H. S., Div. Engr., Armco Drainage & Metal Prod. Inc., 4345 Lyndale Ave., Minneapolis, Minn. 1946
Clegg, R. R., Dist. Sales Mgr., American Lumber & Treating Co., 332 S. Michigan Ave., Chicago 4, Ill. 1946
Coburn, M. (Retired), Service Engineer, 4117 Park Ave., Indianapolis 5, Ind. 1946
Colvin, C. M., Ry. Sls. Engr., Armco Drainage & Metal Prod. Inc., 7th & Parker Sts., Berkeley, Calif. 1945
Cross, E. T., Vice Pres., Armco Drainage & Metal Prod. Inc., Middletown, Ohio. 1946
Crowe, J. A., Mgr., Bird Tie Pads, Bird & Son, Inc., East Walpole, Mass. 1951
Crowley, T. D., Pres., T. D. Crowley & Co., 37 So. Wabash Ave., Chicago 3, Ill. 1946

D

Davis, V. W., Mgr. R. R. Sls., Armco Drainage & Metal Prod. Inc., P.O. Box 1343 Atlanta, Ga. 1946
Detzel, G. E., Geo. E. Detzel Co., 2303 Gilbert Ave., Cincinnati, Ohio. 1945
Duffie, F. J., Serv. Engr., Oxweld R. R. Service Co., 230 N. Michigan Ave., Chicago 1, Ill. 1946

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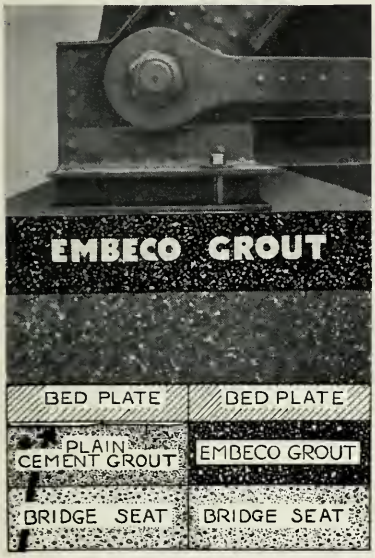

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Ehni, C. R., Prod. Engr., The Texas Co., 1509 S. 59th St., Kansas City, Kan. 1950
Ericson, L. T., Ch. Engr., Jennison Wright Corp., 2463 Broadway, Toledo 1, Ohio. . . . 1948
Eschenbrenner, H., Pres., Universal Concrete Pipe Co., 36 Ashbourne Rd., Columbus, Ohio. 1946
Evinger, F. W., R. R. Repr., Patterson Sargent Co., 1882 S. Normal Ave., Chicago 16, Ill. 1946

F

Farrell, J. I., Sls. Engr., Johns-Manville Sls. Corp., 13 Northern Bldg., Albany, N. Y. . . 1951
Faylor, J. D., Div. Engr., Armco Drainage & Metal Prod. Inc., 444 Insurance Exchange Bldg., Des Moines, Ia. 1946
Fields, P., Sls. Div., Detroit Graphite Co., 3228 N. Broadway, St. Louis, Mo. 1946
Filkins, A. J., Pres., Filkins & Son, Co., 9 So. Clinton St., Chicago 6, Ill. 1927
Fix, F., Sls. Mgr., Transp. Dept., Johns-Manville Sales Corp., 1530 Guildhall Bldg., Cleveland, Ohio. 1946
Flanagan, L. F., Detroit Graphite Co., 1500 S. Western Ave., Chicago 8, Ill. 1937
Fletcher, R. L., Struct'l. Engr., Timber Engineering Co., 1319 18th St. N. W., Washington, D. C. 1947
Flinn, L. E., Sls. & Serv. Repr., Dearborn Chemical Co., Merchandise Mart, Chicago, Ill. . 1949
Forshee, R. E., Pres., R. E. Forshee Co., Inc., 2119 Dana Ave., Cincinnati 7, Ohio. 1951
Fox, E. A., Dist. Mgr., The Master Builders Co., 80 Boylston St., Boston, Mass. 1951
Frederick, H. Z., Mgr. Ry. Sls., The R. C. Mahon Co., Detroit 11, Mich. 1950

G

Gibboney, J. L., Asst. Vice Pres., National Aluminate Corp., 4042 Lessler Blvd., Indianapolis 44, Ind. 1949
Glassgold, I. L., Pres., Masonry Resur. & Con. Co., Inc., B. & O. Coal Pier, Baltimore, Md. 1950

H

Hall, G. E. Jr., Sls. Repr., Johns-Manville Sales Corp., 270 Madison Ave., New York 16, N. Y. 1951
Harding, C. R., Pres., Pullman Co., Chicago, Ill. 1949
Hauslein, H. F. W., Harold Hauslein & Associates, 1110 Maple Ave., Evanston, Ill. 1948
Hickey, J. F., Pres., Baker & Hickey Co., P. O. Box 5008, Tri-Village Sta., Columbus 12, Ohio. 1946
Hoelzel, W. N., Sls., Gary Screw & Belt Div., Pittsburgh Screw & Belt Corp., 122 S. Michigan Ave., Chicago, Ill. 1949
Hoffman, T. E., Div. Mgr. & Fire Prot. Supvr., Zone Co., 917 No. Main St. Fort Worth, Texas. 1949
Holmberg, V. V., Supt., Ellington Miller Co., 25 E. Jackson Blvd., Chicago 4, Ill. 1942
Holstein, F. W., Mech. Engr., The Rails Co., 115 Observer Highway, Hoboken, N. J. . . 1948
Hopkins, W. S., Jr., M. of W. Rep., Air Reduction Sales Co., New York, N. Y. 1949
Hultgren, D. A., David A. Hultgren Co., 80 E. Jackson Blvd., Chicago 4, Ill. 1945

J

Jacobson, A. E., Asst. to Mgr., Oxweld R. R. Service Co., 230 N. Michigan Ave., Chicago, Ill. 1950
Johnston, H. E., Mgr. No-Ox-Id Dept., E. Div., Dearborn Chemical Co., 205 E. 42nd St., New York 17, N. Y. 1947

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Kalinka, J. E., Vice Pres., Roberts & Schaefer Co., 130 N. Wells St., Chicago 6, Ill. 1946
Keatts, B. D., Reg. V.-P., Intrusion-Prepakt, Inc., Room 779, Union Commerce Bldg., Cleveland 14, Ohio. 1946
Kiester, R. S., Sls., Pacific Coast Borax Co., 503 Southern Standard Bldg., Houston 2, Tex. 1950
Kirk, M. G., Sls., Pittsburgh Screw & Bolt Corp., P.O. Box 1708, Pittsburgh 30, Pa. . . . 1948
Kuhlmann, F. H., Dist. Mgr., Dearborn Chemical Co., 1218 Olive St., St. Louis, Mo. . . 1948

L

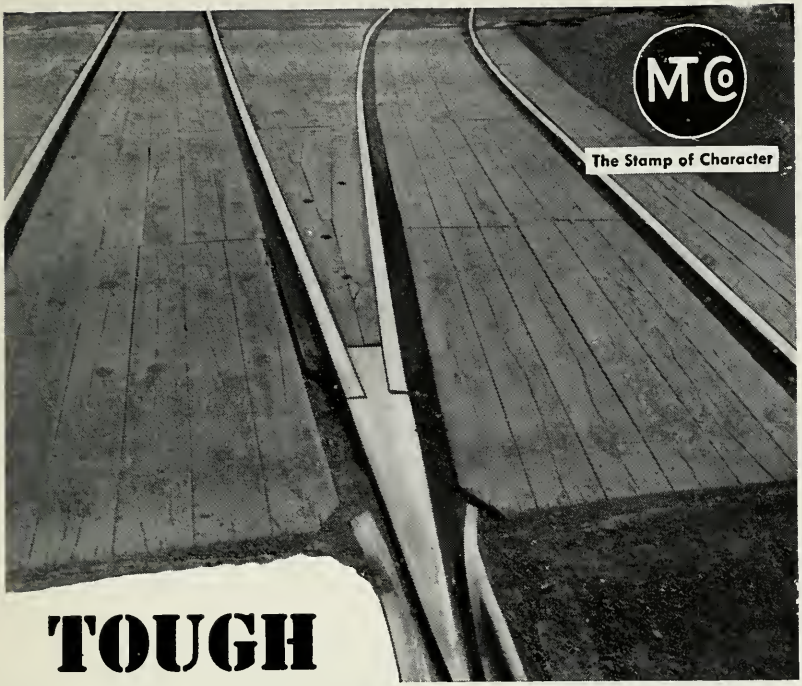
Lacey, J. W., Serv. Engr., The Oxweld R. R. Service Co., 230 N. Michigan Ave., Chicago, Ill. 1946
Leduc, C. L., Field Sls. Mgr., Acorn Refining Co., Suite 1310—109 N. Wabash Ave., Chicago, Ill. 1946
Lee, R. H., Pres., Geo. Vang, Inc., Pittsburgh 19, Pa. 1951
Leypoldt, F., Jr., Pres. Carbolineum Wood Preserving Co., 528 W. Highland Ave., Milwaukee 3, Wis. 1945
Lipscomb, W. P., Mgr., R. R. Sls., Armco Drainage & Metal Prod. Inc., 3524 Plumb St., Houston 5, Texas. 1951
Littleton, E. J., Mgr. R. R. Sls., Jennison-Wright Corp., Granite City, Ill 1949
Lockart, E. P., Mgr., Glass Block Sales, American Structural Products Co., P.O. Box 1035-36 Toledo, Ohio. 1951
Loeffler, J. S., Sls. Engr., Armco Drain & Metal Products, Inc., 4345 Lyndale Ave., No. Minneapolis, Minn. 1948
Luther, L. A., Serv. Engr., Ingersoll Rand Co., 1121 Hamilton Ave., Palo Alto, Calif. . . 1945
Lynch, J. K., Sls. Engr., Massey Concrete Products Co., 3431—27th Ave. North, North Birmingham, Ala. 1951
Lyon, C. A., Reg. Mgr., Master Builders Co., 228 No. LaSalle St., Chicago 1, Ill. 1945

Mc

McDaniel, W. L., Vice Pres., Massey Concrete Products Co., 111 W. Washington St. Chicago 2, Ill. 1945
McFadden, E. C., Dist. Mgr., Pittsburgh Pipe Cleaner Co., 11110 Longwood Drive, Chicago 43, Ill. 1945
McGehee, E. J., Vice Pres. Koppers Co. Inc., 122 S. Michigan Ave., Chicago 3, Ill. 1946
McTaggart, C. A., State Sls. Mgr., No. & So. Dakota, Armco Drainage & Metal Products, Inc., 705 Nat'l Bank of So. Dakota Bldg., Sioux Falls, So. Dak. 1946
McVay, G., Mgr. R. R. Sls. Div., The Ruberoid Co., 307 N. Michigan Ave., Chicago 1, Ill. 1937

M

Mabry, D. B., Mgr. Lumber Sls., T. J. Moss Tie Co., 700 Security Bldg., St. Louis, Mo. 1948
Mann, E. A., Pres., Champion Transportation Sales, Inc., 222 W. Adams St., Chicago, Ill. 1951
Mayfield, P. B., Tech. Consult., Barrett Div., Allied Chemical & Dye Corp., 40 Rector St., New York 6, N. Y. 1950
Mero, C. V., Mastercraft Tile & Roofing Co. No. 1 20th Street, Richmond, Calif. 1949
Meyer, F. J., Ch. Engr. Ry. Prod. Div., Philadelphia Steel & Wire Corp., 9 So. Clinton St., Chicago 6, Ill. 1948
Miller, J. W., Pres., W. M. Corp., 608 S. Dearborn St., Chicago 5, Ill. 1946
Minton, J. H., The Minton Construction Co., 3715 Prospect Ave., Cleveland 15, Ohio. . . 1946
Montgomery, H., Dist. Mgr., The Master Builders Co., 2159 Bay St., Los Angeles, Calif. 1946
Montgomery, Z. J., Sls., Arco Co. of Calif., Ltd., 745 E. 59th St., Los Angeles 1, Calif. 1945
Morris, G. J., Supvr. Serv., Electric Tamper & Equipt. Co., P.O. Box 5, Cambridge, Ohio. 1948
Morton, H. M., Sls. Engr., Johns-Manville Co., 1267 Architects Bldg., Los Angeles, Calif. 1945
Mull, H., Vice Pres. Sls., Warren Tool Corp., 1821 Bankers Bldg., 105 W. Adams St., Chicago 3, Ill. 1946



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Needham, L. H., Vice Pres., The Penetryn System, Inc., 2294 Scranton Rd., Cleveland, Ohio. . . . 1946

P

Paris, G. H., R. R. Repr. Strl. & Rys. Bureau, Portland Cement Association, 33 Grand Ave., Chicago 10, Ill. . . . 1945

Patterson, R., Vice Pres., Intrusion Prepakt, Inc., 80 E. Jackson Blvd., Chicago 4, Ill. . . . 1946

Powers, D. D., Sls. Engr., Dearborn Chemical Co., 1101 Union Central Bldg., Cincinnati 2, Ohio. . . . 1947

R

Rausch, C. C., Asst. Vice Pres., Dearborn Chemical Co., Merchandise Mart., Chicago 54, Ill. . . . 1944

Redding, G. H., Pres., Massey Concrete Prod. Co., 111 W. Washington St., Chicago 2, Ill. . . . 1946

Robertson, W. O., Div. Sls. Engr., Armco Drainage & Metal Prod. Inc., P.O. Box 1657, Baltimore 3, Md. . . . 1946

Ruhl, D. A., Constr. Engr., Timber Structures, Inc., 120 South La Salle St., Chicago 3, Ill. . . . 1948

S

Scott, J. M., Sls., The Arco Co., 614 Delaware St., Scranton, Pa. . . . 1945

Shoop, J. W., Vice Pres., The Lehon Company, 4425 S. Oakley Ave., Chicago 9, Ill. . . . 1945

Smith, F. C., R. R. Fire Prot. Engr., Marsh & McLennan, Inc., 231 S. LaSalle St., Chicago 4, Ill. . . . 1948

Smith, W. T., Gen. Supt., Geo. E. Detzel Co., 2303 Gilbert Ave., Cincinnati, Ohio. . . . 1950

Snow, B. S., Pres., T. W. Snow Constr. Co., R. R. Supplies, 10 W. Wilson St., Batavia, Ill. . . . 1946

Southwick, C. E., Factory Repr., Homelite Corp., 624 S. Anderson, Los Angeles 23, Calif. . . . 1945

Spietz, A. L., Pres., Interstate General Contractors, Inc., 5621 N. Glenwood Ave., Chicago, 40, Ill. . . . 1950

Spietz, W. P., Monarch Painting Service, 5621 N. Glenwood Ave., Chicago 40, Ill. . . . 1950

Stierer, G. W., Mgr. Structural Steel Dept., Robert W. Hunt Co., 175 W. Jackson Blvd., Chicago 4, Ill. . . . 1946

T

Thompson, N., Vice Pres., Homelite Corp., Port Chester, N. Y. . . . 1946

Tracy, R. N., Mgr. R. R. Sls., Armco Drainage & Metal Products, Inc., P.O. Box 2170, Denver 1, Colo. . . . 1946

Truss, F. W., Mgr. R. R. Sls., Armco Drainage & Metal Prod. Inc., 817 Ambassador Bldg. St. Louis 1, Mo. . . . 1946

Twomey, J. F., Vice Pres., McCracken Contracting Co., 7340 S. Western Ave., Chicago, Ill. . . . 1948

U

Utley, O. H., Vice Pres., The Zone Co., Southwestern Pet. Co., 917 N. Main St., Fort Worth, Texas. . . . 1949

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VandenBoom, R. G., Pres., Pacific Union Metal Co., 3248 Long Beach Ave., Los Angeles 54, Calif. 1946

W

Walters, W. R., Gen. Mgr., Railway Ballast Cond. Corp., 1460 Rand Tower, Minneapolis, Minn. 1949
Weir, K. J., W-M Corp., 608 S. Dearborn Street, Chicago 5, Ill. 1940
Whipple, B. E., Sls. Engr., Pacific Union Metal Co., P.O. Box 2616, Term. Annex., Los Angeles 54, Calif. 1946
Wilson, W. C., Sls. Engr., Ralph W. Payne Co., Washington, D.C. 1951
Winters, F. T., Jr., Mgr., Weed Control Div., Pacific Coast Borax Co., P.O. Box 9128, Station "S," Los Angeles 5, Calif. 1949
Wood, B. R., Master Builders Company, 7016 Euclid Ave., Cleveland, Ohio. 1937

Y

Young, R. W., Jr., R. W. Young Mfg. Co., 20 N. Wacker Drive, Chicago 6, Ill. 1946

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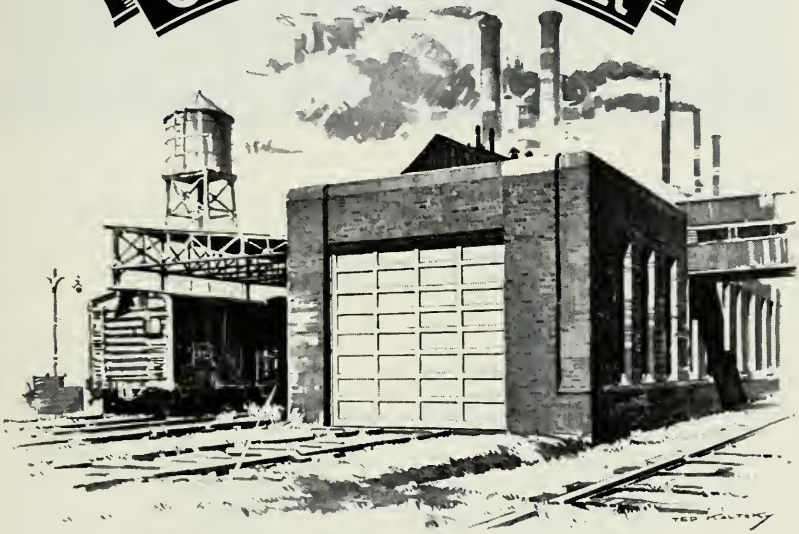

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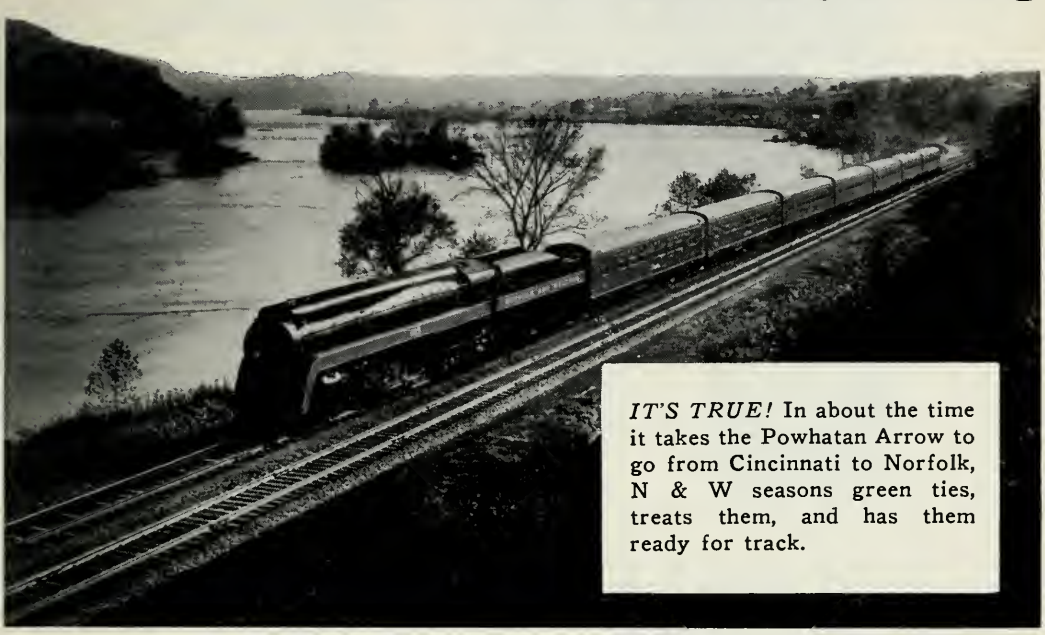
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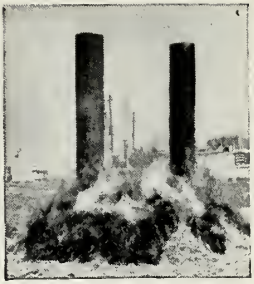

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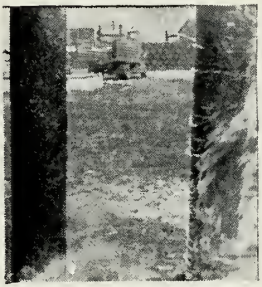
Both poles shown 16 minutes after the start of the test. The FIRE-PLATE treatment has prevented any traceable damage to the left pole.



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15	Pittsburgh, Pa.	Oct. 17-19, 1905	313
16	Boston, Mass.	Oct. 16-18, 1906	340
17	Milwaukee, Wis.	Oct. 15-17, 1907	341
18	Washington, D. C.	Oct. 20-22, 1908	368
19	Jackonsville, Fla.	Oct. 19-21, 1909	393
20	Denver, Colo.	Oct. 18-20, 1910	428
21	St. Louis, Mo.	Oct. 17-19, 1911	499
22	Baltimore, Md.	Oct. 15-17, 1912	524
23	Montreal, Quebec	Oct. 21-23, 1913	570
24	Los Angeles, Cal.	Oct. 20-22, 1914	586
25	Detroit, Mich.	Oct. 19-21, 1915	665
26	New Orleans, La.	Oct. 17-19, 1916	710
27	Chicago, Ill.	Oct. 16-18, 1917	704
28	Chicago, Ill.	Oct. 15-17, 1918	716
29	Cleveland, Ohio	Oct. 21-23, 1919	776
30	Atlanta, Ga.	Oct. 26-28, 1920	840

No.	Place of Meeting	Date	Membership
31	New York, N.Y.	Oct. 18-20, 1921	850
32	Cincinnati, Ohio	Oct. 17-19, 1922	865
33	Seattle, Wash.	Oct. 16-18, 1923	846
34	Kansas City, Mo.	Oct. 21-23, 1924	837
35	Buffalo, N.Y.	Oct. 20-22, 1925	759
36	Richmond, Va.	Oct. 12-14, 1926	750
37	Minneapolis, Minn.	Oct. 18-20, 1927	754
38	Boston, Mass.	Oct. 23-25, 1928	755
39	New Orleans, La.	Oct. 15-17, 1929	755
40	Louisville, Ky.	Oct. 21-23, 1930	713
41	Chicago, Ill.	Oct. 16-18, 1934	592
42	Chicago, Ill.	Oct. 15-17, 1935	547
43	Chicago, Ill.	Oct. 20-22, 1936	588
44	Chicago, Ill.	Oct. 19-21, 1937	566
45	Chicago, Ill.	Oct. 18-20, 1938	589
46	Chicago, Ill.	Oct. 17-19, 1939	546
47	Chicago, Ill.	Oct. 15-17, 1940	610
48	Chicago, Ill.	Oct. 14-16, 1941	594
49	Chicago, Ill.	Oct. 20-22, 1942	618
50	Chicago, Ill.	Oct. 20-21, 1943	597
51	Chicago, Ill.	Sept. 17-19, 1946	698
52	Chicago, Ill.	Sept. 16-18, 1947	651
53	Chicago, Ill.	Sept. 20-22, 1948	652
54	Chicago, Ill.	Sept. 12-14, 1949	676
55	Chicago, Ill.	Sept. 18-20, 1950	713
56	Chicago, Ill.	Sept. 17-19, 1951	676

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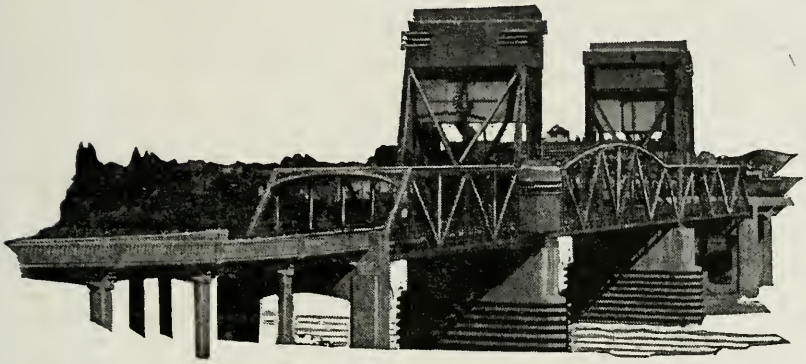

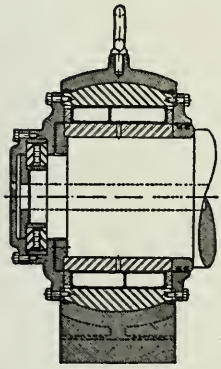

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